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# The AUTOMOBILE

Maud L'Anphere Crook

Vol. XXXVI  
No. 3

NEW YORK, JANUARY 18, 1917

Ten cents a copy  
Three dollars a year



About that Car of Yours—



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Make 1917 your banner year! You can do it if you get started right. Determine now to sell nothing but advertised goods—accessories of known value with a reputation and record for service. Eliminate from your line the accessories which demand so much sales effort. They cannot be profitable. Successful retailing of automobile accessories depends entirely upon the brands you carry in stock. Accessories which have a quick turnover, and for which there is a big demand, are real money-makers. You really can't afford to handle any other. Look about you and note the successful merchants in other lines. In nearly every case you

will find their success is due to featuring only advertised goods. Stewart Products are leaders—a line that is standard, well-known and widely advertised. Stewart Products have a name and reputation second to none. That is why Stewart Products are the fastest-selling accessories today. This is the line you should feature and concentrate on for 1917. Let Stewart Products help make 1917 your biggest, most profitable year. Start right now—determine to sell nothing but advertised goods—begin with a complete line of Stewart Products. "It will pay you to see that every car is Stewart-equipped"

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\$3.50



Stewart  
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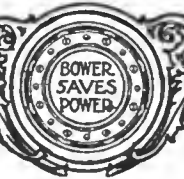
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Detroit - Michigan

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**I**T is a certification of extreme care to prevent failure. It is the Wyman-Gordon receipt to the purchaser that every method known to modern engineering has been employed to guard against the slightest discrepancy. It is the Hall-Mark of a "Finished" Forging. Given a good design, certain specified materials, careful workmanship—and, theoretically, a good forging could be expected. But Wyman-Gordon methods go very much further than that.

They first check the design; then make certain by exhaustive tests that the material is up to the mark; that the workman-

ship is unerring. They then test the finished product in every conceivable way to guard against the slightest deviation.

Results of all such tests are sent to our customers with the product, so that they may know precisely what they are getting down to the minutest detail.

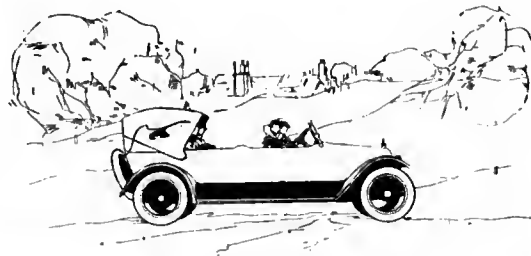
This embodies the Wyman-Gordon idea of a finished forging. The experienced engineer knows that such a forging is always the cheapest to buy, for not only can he be certain of it, but he is spared the trouble and expense of finishing it himself.

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GUARANTEED FORGINGS

**The AUTOMOBILE**  
 THE CLASS JOURNAL COMPANY  
 231-241 W. 39th STREET NEW YORK CITY  
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(Patented)

As determining the capacity of a car or truck for rendering high-class service, no single item however small can be considered of minor importance. For instance—a broken or sluggish or inefficient bearing in magneto or lighting generator or starting motor will so cripple these accessories as to destroy their functions in the unit performance by which the car or truck will be measured.

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See that your  
**Electrical Accessories**  
 are "NORMA" Equipped



**THE NORMA COMPANY OF AMERICA**  
 1790 BROADWAY NEW YORK  
 Ball, Roller, Thrust, Combination Bearings

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# Studebaker

Established 1852



**T**HAT both the products and policies of Studebaker are particularly liberal in the benefits to the dealer is evidenced by the extreme satisfaction voiced by over 6,700 men who represent it in all parts of the country. These photographs show but a few of the many enthusiastic dealers' meetings conducted by Studebaker throughout the year. Studebaker dealer connections are based on something more than a general agreement as to territory

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The reasons why these dealers regard their association with Studebaker as such a strong asset may be of interest to you.

## STUDEBAKER

South Bend, Ind. Detroit, Mich. Walkerville, Ont.

*Address all correspondence to Detroit*



Please mention The Automobile when writing to Advertisers

# The AUTOMOBILE

VOL. XXXVI

NEW YORK—THURSDAY, JANUARY 18, 1917—CHICAGO

No. 3

## Italian Fiat Absorbs U. S. A. Co.

### Heaviest Stockholders in U. S. Retain Interests—Josephs, in Europe, to Return

PARIS, FRANCE (*Special Cable*), Jan. 14—The Fiat Co., of Poughkeepsie, N. Y., has been taken over by the home factory of the Fiat Co., Turin, Italy, according to information obtained in Italy a few days ago. The details of the deal are not disclosed, but it is understood that some of the heaviest stockholders in the U. S. A. Fiat factory retain their interest. J. S. Josephs, treasurer, retains his interest. Mr. Josephs is at present in Europe but sails for America in a day or so.

### Allen Motor Co. to Build

FOSTORIA, OHIO, Jan. 16—The Allen Motor Co. will build a large motor car plant on a 50-acre site and will employ 1000 men. All parts of the automobile will be made here. The company has announced that additional workers will be employed later because of other factories joining the Allen company.

### Hunt Joins A. O. Smith Co.

DETROIT, Jan. 16—Frank J. Hunt, purchasing agent for the Weston-Mott Co., has resigned to become the purchasing agent of the A. O. Smith Co., Milwaukee. It is reported that Fred Wade, purchasing agent for the Buick Motor Co., will take care of the purchasing department of the Weston-Mott Co. in addition to his present duties.

### Metzger Heads Detroit Club

DETROIT, Jan. 17—William E. Metzger, president of the Auto Parts Mfg. Co., has been elected president of the Detroit Automobile Club; Martin L. Pulcher, vice-president and general manager of the Federal Motor Truck Co., is vice-

president; Edward N. Hines, chairman Board of County Road Commissioners, second vice-president; Sidney D. Walton, consulting engineer, third vice-president; W. B. Bachman, secretary, and J. Lee Barrett, treasurer. Directors include Martin L. Pulcher; W. A. Brush, manager Brush Engineering Assn.; R. K. Davis, sales manager Penn Spring Works; E. W. Lewis, vice-president Timken-Detroit Axle Co.; A. O. Dunk, president Puritan Machine Co.; Sidney D. Walton; William E. Metzger; M. C. DeWitt, secretary Jeffery-DeWitt, and Edward N. Hines.

### Continental Offers \$3,500,000 Stock

NEW YORK, Jan. 17—The Continental Motors Corp. is today offering for subscription \$3,500,000 7 per cent cumulative preferred stock, par \$100. The new corporation, which recently acquired the entire property and business of the Continental Motors Co., has a capital of \$3,500,000 preferred, and \$14,522,580 common, par \$10. The public offering is being handled by Lee, Higginson & Co., and William P. Bonbright & Co., at 97½ and accrued dividend.

### Slater Promoted by Firestone

CHICAGO, Jan. 12—W. J. Slater has been appointed special representative of the general sales department of the Firestone Tire & Rubber Co. He was formerly manager of the sales-promotion department of the company.

### D. A. C. to Honor Chalmers

DETROIT, Jan. 15—Hugh Chalmers will be the guest of honor at a dinner given by members of the Detroit Athletic Club this week. The occasion marks the retirement of Mr. Chalmers from the club presidency. The invitations issued were made up in the form of a stock prospectus, "Hugh Chalmers, Inc.," etc.

Among those who will attend will be James Couzens, W. O. Briggs, Mayor Oscar B. Marx, Harry Ford, Howard Coffin and B. G. Koether.

## Winton Wins Axle Suit Appeal

### Court Reverses Decree of Nov. 20, 1915, in Favor of Lindsay Auto Parts Co.

CINCINNATI, Jan. 13—An opinion reversing the decree against the Winton Motor Carriage Co. in the axle suit brought by the Lindsay Motor Parts Co. has been handed down by the U. S. sixth circuit court of appeals.

The Lindsay company brought suit in the U. S. district court, Cleveland, Jan. 21, 1915, charging infringement of driving axle patent No. 748,760. Judge John H. Clarke handed down an opinion in favor of the plaintiff on Oct. 13, 1915, on the grounds that the inventor had shown evidence of the priority of his invention over similar axles, that the Lindsay axle constituted an invention, that the defendant was aware of the fact that the plaintiff had obtained patents on the invention, and other particulars.

The feature of the construction covered by the patent was that it allowed the inner or driving axles to be longitudinally removed from the tubular sections and inspected, repaired or replaced without disturbing the body of the car or dismantling the outer casings. The construction also permitted the differential to be inspected or withdrawn without dismantling any part of the car other than one-half the central section of the axle.

### Decision of Lower Court

Judge Clarke handed down a decree on Nov. 20 calling for a perpetual injunction against the Winton company restraining it from making the type of axle in question. The company appealed Dec. 8, 1915, and obtained on the same date an order from Judge Clarke suspending the injunction during the appeal of the suit.

## Chevrolet Prices Are Higher

490 Model Is Now \$550 and Eight Is \$1,385—Other Price Increases

FLINT, MICH., Jan. 12—The Chevrolet Motor Co. has increased the prices of its products. The 490 is now \$550, an increase of \$90; the eight-cylinder model is \$1,385, which is \$285 more than was originally planned.

### Owen Magnetic Prices Increased

CLEVELAND, Jan. 12—All models of the Owen Magnetic cars were increased in price Jan. 1. The 125-in. wheelbase chassis on which is built a coupé, touring car, limousine and landaulet, has gone up \$150. The 136-in. wheelbase chassis on which is built a roadster, four and seven-passenger touring car, limousine and landaulet, has been advanced \$200.

### New Selden Prices Jan. 15

ROCHESTER, N. Y., Jan. 16—Four models of Selden trucks were increased in price on Jan. 15. The 1-ton worm-drive was advanced to \$1,850 from \$1,700; the 2-ton worm-drive was raised from \$2,200 to \$2,350; the 2-ton internal-gear-drive is now priced at \$2,150, formerly \$2,000; and the 3½-ton worm-drive has gone up to \$3,150 from \$2,950. The light delivery worm-drive truck remains at \$985, and no change has been made in the price of the \$1,385 1-ton internal-gear-drive truck. A 5-ton model with price and specifications will be announced shortly.

### Reeke Resigns from Nash

DETROIT, Jan. 15—Al Reeke, general manager for the Nash Motors Co., has resigned and will enter business for himself as a Nash distributor.

### C. H. Vincent Is Packard Experimental Engineer

DETROIT, Jan. 12—C. H. Vincent, who was formerly associated with Ralph Mulford and E. C. Patterson, has severed his connection with the Hudson Motor Car Co. and is now an experimental engineer for the Packard Motor Car Co.

### Goodyear Adds Cord Truck Tire

NEW YORK, Jan. 12—The Goodyear Tire & Rubber Co., Akron, has introduced a line of cord pneumatic truck tires for use in long hauls and interurban work. The company has for some time been making pneumatic truck tires of fabric construction which have given satisfactory mileage. The cord tires for trucks

are not specially constructed tires, but represent simply the application of this principle to tires made in the proper sizes for truck use. In the method of construction they are identical with the cord tires for passenger cars. They come in the All-Weather Black Tread, and are made in sizes 36 by 6, 38 by 7, 40 by 8 and 42 by 9, with ten to sixteen plies of cords, according to the size of the tire. The prices are a little higher than similar sizes in solid tires.

### Baum Succeeds Murray as Empire Tire President

TRENTON, N. J., Jan. 13—The reorganization of the Empire Rubber & Tire Co. has been effected to increase the business and working capital. J. E. Baum, a director of the Corn Exchange Bank of New York and president of the Supplee-Biddle Hardware Co., Philadelphia, has been elected president of the new company, succeeding C. Edward Murray of this city. The new company will have preferred stock of \$1,500,000 and \$3,000,000 of common.

General Murray retains a substantial interest and remains a member of the board of directors, while one son, C. Edward Murray, Jr., is a vice-president, and his other son, J. Cornell Murray, is treasurer of the new company.

### Goodyear Men to Study Rubber in India

AKRON, Jan. 12—Charles Seiberling, son of C. W. Seiberling, vice-president of the Goodyear Tire & Rubber Co., and L. G. 'Odell of the crude rubber department have gone to India for an extended stay and will make a study of the rubber plantations.

### Hartzell Promoted by Goodyear

AKRON, Jan. 15—R. S. Hartzell, formerly manager of the Cleveland branch of the Goodyear Tire & Rubber Co., has been made manager in charge of automobile manufacturers' business for the State of Ohio. Mr. Hartzell is succeeded at Cleveland by F. N. Hammond, formerly manager at the Youngstown branch.

### Fisher Buys Vacuum Brake Patent

DETROIT, Jan. 15—It is reported that R. R. Thomas, head of the Electrical Equipment Co., Los Angeles, has sold his patent for a vacuum foot brake to Carl G. Fisher, J. A. Allison and other associates of Indianapolis. The basis of the sale is that of a royalty.

### Assmus Is Maxwell Export Manager

DETROIT, Jan. 12—C. O. Assmus, who has been associated with the foreign department of the Maxwell Motor Co., Inc., has been made export sales manager.

## Kerosene Engine in Ingram-Hatch

New Car Also Has Friction Drive, Spring Wheels and Sectional Tires

NEW YORK, Jan. 16—The Ingram-Hatch, a new car announced by the Ingram Hatch Motor Corp., of this city, with factory at Staten Island, certainly possesses the distinction of novelty. Its brief specification includes a four-cylinder kerosene engine, an elaborate friction drive and a suspension in which spring spoke wheels are included. There are also air cushions in the wheels and the tires are sectional, made of leather steel studded. These tires are filled with a resilient substance and can be replaced in sections.

### Ford to Increase Production

DETROIT, Jan. 16—The Ford Motor Co. is ordering sheet bar and forging stock for deliveries up to the middle of 1918. The orders are much larger than for any previous corresponding period. This indicates a greatly increased production schedule for the coming year. In 1916 the company produced 533,921 cars.

### Nash Stockholders Re-elect Directors

BALTIMORE, MD., Jan. 11—The stockholders of the Nash Motors Co. at their annual meeting re-elected the retiring board of directors and approved the annual report. The report was not issued to the public.

Later at a directors' meeting C. W. Nash was re-elected president and the other officers were also re-elected.

Mr. Nash in his report stated that the output of the company has been increased 50 per cent.

### Voorhis Heads Nash Sales

KENOSHA, WIS., Jan. 15—C. B. Voorhis will become head of the selling division of the Nash Motors Co., this city, early in February. Mr. Voorhis recently resigned from the Oakland Motor Car Co., of which he was vice-president, director and general sales manager.

### Smith Promoted by Bound Brook

BOUND BROOK, N. J.—Jan. 16—A. K. Smith has been appointed production manager of the Bound Brook Oil-less Bearing Co. He has been with the concern 3 years.

### Blomstrom with Safety Motor Co.

GRENLOCH, N. J., Jan. 12—C. H. Blomstrom, veteran automobile builder, is now connected with the Safety Motor Co., this city. This concern is making the Frontmobile, which is driven entirely by the front wheels.

## Knight Special Worm-Driven

Also Featured with Entz  
Magnetic Transmission and  
Moline Engine

NEW YORK, Jan. 11—A car in which the three features of a Knight engine, Entz magnetic transmission and worm drive are combined is being developed in this city by Watson and Stoekle, 351 West Fifty-seventh Street. It will be called the Knight Special and the chassis will be sold at approximately \$4,000 or will be equipped with a custom body to suit the purchaser.

### 61-in. Cantilever Rear Springs

The engine used is the Moline-Knight four-cylinder 4 by 6. One of the other features is the rear suspension consisting of unusually long cantilevers—61 in. There are no levers visible in the drivers compartment, the gearshift of course being replaced by the Entz controller and the emergency brake being pedal-operated. The wheelbase is 132 in. Leather universals are used and Timken axles. One car has been built and plans are going forward for a moderate production this year.

### Fageol Has 125 Hp. Motor and Sells for \$9,500

CHICAGO, Jan. 15—One of the most interesting cars at the Chicago show will be the Fageol, which has one of the highest priced chassis in the world, if not the very highest.

The chassis sells for \$9,500. The car will be exhibited as a four-passenger touring speedster and is equipped with a Hall-Scott six-cylinder aviation motor, rated 125-150 hp. A special custom body is now being fitted to the chassis at the shops of the C. P. Kimball Co. The motor is equipped with Bosch electric lighting, starting and ignition apparatus and with the gearset takes up about three-fourths of the length of the chassis. Connection between the gearset and the Kardo axle is by a short shaft and universal. Light weight is a distinctive feature of the car, which is different in appearance from any other on the market and is characterized by a wedge-shaped radiator and an unusually low body.

### Chandler Elects Two New Directors

NEW YORK, Jan. 13—At a meeting of the directors of the Chandler Motor Car Co. held here last week, vacancies on the board caused by the resignation of James B. Bell, of Toledo, and James S. Dunstan, of this city, were filled by the election of John Sherwin, president of the First National Bank of Cleveland and

Charles A. Otis, senior member of the banking firm of Otis & Co., Cleveland.

The board as now constituted consists of F. C. Chandler, president; W. S. M. Mead, vice-president; Samuel Regar, treasurer; J. V. Whitbeck, chief engineer; J. W. Prentiss, of Hornblower & Weeks, John Sherwin, First National Bank of Cleveland and Charles A. Otis, of Otis & Co., Cleveland.

President Chandler reported that the fiscal year of 1916 just closed had been the most satisfactory one in the history of the company, that orders already booked for delivery of cars in 1917 indicated still greater prosperity for the company. He also stated that for January, 1917, shipments will show an increase of approximately 100 per cent over the same period a year ago.

### Teasdale Heads Federated Motors

INDIANAPOLIS, IND., Jan. 15—The final working out of the details of the recent merger of the Empire Automobile Co. and the Pathfinder Co. is being completed in New York by Boughton & Co., who are financing the scheme. As was stated last week, the Federated Motors Co. is being formed, with W. C. Teasdale as president. W. E. Stalnaker is vice-president and W. K. Bromley secretary. The three officers were formerly of the Pathfinder company, Teasdale as president, Bromley as secretary-treasurer, and Stalnaker as sales and advertising manager.

According to plans, it will be a policy of the new company to combine as possible both the Empire and Pathfinder cars under one roof in the various cities.

### Johnson Jordan Purchasing Manager

KENOSHA, WIS., Jan. 15—J. F. Johnson, assistant purchasing agent of the Nash Motors Co., and its predecessor, the Thomas J. Jeffery Co., Kenosha, Wis., has resigned to accept the position of manager of purchases of the Jordan Motor Car Co., Cleveland, Ohio.

### Thomas & Thomas, Consulting Engineers

DETROIT, Jan. 16—Thomas & Thomas, consulting engineers, have opened offices in the Garfield Building, 170 Woodward Avenue. The partnership consists of W. Owen Thomas and his brother, T. R. Thomas. For 2 years W. Owen Thomas was connected with the Canadian government in charge of motor transport.

### Olympian Car Production Starts

PONTIAC, MICH., Jan. 15—Production of cars by the Olympian Motors Co. has started at the Pontiac factories. The models will be shown for the first time at the Detroit automobile show Jan. 20 and at the Hotel Sherman at the time of the Chicago automobile show.

## LeRoi Co. to Build Engines

Takes Over Milwaukee  
Machine Tool Co. Plant—A  
New Six Model

MILWAUKEE, WIS., Jan. 13—The LeRoi Co., incorporated under the laws of Wisconsin with a capital stock of \$350,000, has taken over the plant and the gasoline engine business established several years ago by the Milwaukee Machine Tool Co., Milwaukee, and will devote its attention exclusively to the manufacture of four and six-cylinder engines for passenger cars, light commercial cars and light tractors. The name of the new concern is the trade name of "LeRoi," adopted by the machine tool company for its engines when it first engaged in this line of production.

Officers of the LeRoi Co. are: President and general manager, Charles W. Pendock; vice-president, J. Roy Frantz; secretary and treasurer, Norman Christiansen. Mr. Pendock is a well-known British engineer and designer, who was associated with several large automobile manufacturers in England until 1910, when he came to America to join a large machine tool company at Cleveland as chief engineer and designer. Three years ago he came to Milwaukee as chief engineer, designer and general manager of the Milwaukee Machine Tool Co. He is responsible for the design of the LeRoi engine.

The company is to market a six-cylinder type in addition to the line of four-cylinder engines already manufactured. The new design is essentially a passenger car type and is 3½ by 5 in. The four-cylinder types are 3½ by 4½ in., 2½ by 4 in. and 2½ by 3½ in. Among the manufacturers who have contracted for LeRoi motors are: Denby Motor Truck Co., Detroit; Day-Elders Motors Corp., Newark, N. J.; Selden Motor Vehicle Co., Rochester, N. Y., and the New Era Engineering Co., Joliet, Ill.

The plant is located at Sixtieth Avenue and Mitchell Street, in West Allis, the big manufacturing suburb of Milwaukee. The machine tool business has been removed and consolidated with the Kearney & Trecker Co., one of the largest builders of milling machines in the United States, also located in West Allis.

### Roe with Nelson

DETROIT, Jan. 15—J. G. Roe, who was connected with the Hupp Motor Car Corp., has joined E. A. Nelson and will look after sales details for the new Nelson car.

## 216,936 Prospects in N. W.

Farmers in Minn. in 1916 Owned 62,757 Cars—  
33 1/3% Gain

MINNEAPOLIS, Jan. 16—Among the farmers of Minnesota, the Dakotas and Eastern Montana, Northern Iowa and Western Wisconsin are 216,936 who are prospects for automobile concerns. This is the estimate of *The Farmer*, St. Paul publication, which has completed its annual census of automobiles in Minnesota as of Nov. 1, 1916. It is the seventh annual census and develops that farmers of the state owned 62,757 cars, which is a gain of 16,000 in a year, or 33 1/3 per cent.

Farmers own 52 per cent of the cars in the state, and on this basis is calculated the extent of the field for future sales in Twin City automobile territory.

In the three large cities, Minneapolis, St. Paul and Duluth, are owned 30,096 cars, or one for each twenty-five persons. At this ratio, citizens of towns outside the tri-cities own 26,096 machines, or 58,192 for the cities, leaving 62,750 for the farmers. In Twin City territory are 433,873 farmers, that is in the states above mentioned.

License plates issued in Minnesota number above 130,000, but the census considered numbers 118,949 actually in hands of owners on Nov. 1.

This total is more than double the figure for 1914, which was 64,185, and over three times the registration for 1913, which was 42,664.

### Hamilton Motors Co. to Organize

DETROIT, Jan. 16.—Following closely on the appointment of the receiver for the Alter Motor Car Co. comes the announcement that the Hamilton Motors Co. will be organized at Grand Haven with a capital of \$500,000. Originally, the Alter company planned to erect a large plant at Grand Haven and many Grand Haven and Muskegon citizens subscribed for Alter stock.

Guy Hamilton, who is organizing the new concern, has planned to ask stockholders of Alter stock in western Michigan to exchange for stock of the Hamilton company, on an equal exchange basis. The new concern plans to build the Hamilton four having a wheelbase of 110 in., and the six having a 115-in. wheelbase. Production is planned by Feb. 1.

### Masten Is Oakland Sales Manager

NEW YORK, Jan. 15—W. H. Masten has succeeded C. B. Voorhis as general sales manager of the Oakland Motor Car Co. of Michigan, Pontiac. This an-

nouncement was made by F. W. Warner, president and general manager of the company, at a dinner given by him to Mr. Masten, Mr. Voorhis and a number of Oakland officials and distributors at the Hotel Manhattan on Jan. 11. Mr. Masten is a Canadian by birth, but has lived in the Middle West and Southwest practically all his business life. He has been in the implement business for 30 years, during the last 20 of which he has held executive positions of prominence. Mr. Masten began in the retail implement and grain business in Missouri, later being associated with Amos Whiteley & Co., Springfield, Ohio, and then joining the Moline Plow Co., with which concern he was affiliated for 23 years.

### Elgin Profits \$1,000,000

CHICAGO, Jan. 12—Profits for the year amounting to approximately \$1,000,000 were reported by the secretary-treasurer of the Elgin Motor Car Corp. at the annual meeting of stockholders held in Chicago Jan. 9. The company expects to produce 7500 cars during the coming year. The following officers were unanimously re-elected by the 2500 stockholders present: Frederick L. Brown, president; C. S. Rieman, vice-president and general manager; W. G. Knoedler, secretary and treasurer. The board of directors was also re-elected.

### Winters Heads Victor Battery

ROCK ISLAND, ILL., Jan. 13—At the annual meeting of the stockholders of the Victor Storage Battery Co., this city, officers for the ensuing year were elected as follows: President, B. E. Winters; vice-president, G. E. Brown; secretary, B. F. White, and treasurer, T. D. White. A recent increase in the capital stock to \$100,000, to take care of expanding business, was indorsed.

### Picard Takes Stromberg in New York

NEW YORK, Jan. 12—A. J. Picard & Co., this city, accessory dealer, will on March 1 take on the Stromberg carburetor, now handled by the Stromberg Motor Devices Co., factory branch. F. E. Tucker will resume his duties as wholesale manager with the A. J. Picard company.

### Hard Takes Over Superfactor

BUFFALO, N. Y., Jan. 10—The Hard Mfg. Co., this city, has taken over the Willet Superfactor, a device consisting of an auxiliary air valve system for attachment to the intake manifold, and expects to manufacture the superfactor and market it. Heretofore the superfactor has been manufactured by the Buffalo Motor Appliance Co., Buffalo, N. Y.

## Exports Increase in November

6992 Cars and Trucks Shipped Abroad—Gain Is 1749 Over 1915

WASHINGTON, D. C., Jan. 13—The outstanding features of the American automobile export trade during November last were the continued increase in the number and value of passenger cars exported, an unexpected rise in the number of commercial cars shipped abroad, and a constantly rising market for American cars in South America and Asia and Oceanic countries. The passenger cars exported in that month numbered 5337, valued at \$4,016,930, as against 3690, valued at \$2,791,507, during the corresponding month of 1915. Exports of commercial cars jumped from 1553 machines valued at \$3,837,307, in November, 1915, to 1655 cars, valued at \$5,175,114, in November last. Exports of parts, not including engines and tires, increased from \$1,693,787 to \$2,151,434 during the same periods.

While exports of commercial cars showed a substantial increase in November, they fell behind several million dollars during the 11 months' period, dropping from 20,430 cars, valued at \$55,918,770, in 1915, to 17,572 cars, valued at \$49,181,460, in 1916. On the other hand, the shipments of pleasure cars increased from 38,200, valued at \$32,334,332 to 57,036 cars, valued at \$40,066,427, during these periods, while parts exports, not including engines and tires, increased from \$14,878,647 to \$22,243,237. Some shipments by countries are:

France	862	\$3,070,209
United Kingdom	642	1,812,166
Canada	659	488,438
British East Indies	566	399,278
Argentina	386	273,883
Russia	142	264,074
Australia	312	168,572
Asia and Oceania	1,331	1,200,170

### Complete Economy-Bellefontaine Merger

BELLEFONTAINE, OHIO, Jan. 16—The merging of the Economy Motor Co., Tiffin, Ohio, with the Bellefontaine Automobile Co., has been completed. The new concern will retain the name of the Economy Motor Co. and will move its factory here from Tiffin, and manufacture passenger cars. Officers elected are: President, A. J. Miller; vice-president, R. W. Miller; treasurer, F. C. Spittle; secretary, Johnson West.

### New Ellis Silent Motor

DETROIT, Jan. 16—The Ellis Silent Motor Co., with which Edwin J. Ellis, inventor of the Ellis motor, is connected, will have the backing of St. Joseph, Mich., business men through its initial organization. The motor will be exhibited at Chicago.

## Show Attendance 15% Greater

### Record Sales of Cars and Accessories—Many New Dealers Appointed

NEW YORK, Jan. 15—New York's greatest automobile show came to an end here Saturday night after breaking all records in attendance, retail business transacted, dealers' contracts signed and general public enthusiasm in the history of the industry. It is estimated by the N. A. C. C. officials that the attendance was 15 per cent or more greater than at last year's show. The same authority is responsible for the statement that more dealers attended the show than ever before, although it has not yet been possible to complete a count. Practically every exhibitor reported increased sales as compared with the show of 1916 and all were tremendously enthusiastic over the great increase in popular interest and general readiness to purchase cars.

The show enabled many dealers to close sales that had been under negotiation for some time and furnished all of them with long lists of prospects which will keep them busy for many weeks to come.

That the show was the greatest ever held is everywhere evident. Unofficial estimates of the attendance ranged from 300,000 to 500,000, but, of course, this is merely a matter of conjecture.

The N. A. C. C. reports that the new method of handling dealers is much more successful than that formerly employed and the dealers were better satisfied.

### New Exhibition Building for New York

NEW YORK, Jan. 12—This city is to have additional exhibition space, seating 40,000 according to plans which are being formulated for the construction of a large amphitheater to occupy an entire city block some place between Forty-second and Fifty-ninth Streets and Fifth and Seventh Avenues. The building is to cost between \$7,000,000 and \$8,000,000, and is expected to be finished next year.

### M. & A. M. Re-Elects Stiger Pres.

NEW YORK, Jan. 15—C. W. Stiger of the Stromberg Motor Devices Co. was re-elected president of the Motor and Accessory Manufacturers at the annual meeting of the board of directors. Other officers elected were: First vice-president, Charles E. Thompson, president of the Steel Products Co., Cleveland; second vice-president, E. H. Broadwell, vice-president of the Fisk Rubber Co., Chicopee Falls; third vice-president, T. J. Wetzels, of the Precision Die

Casting Co., Syracuse; treasurer, L. M. Wainwright, president of the Diamond Chain & Mfg. Co., Indianapolis; secretary and assistant treasurer, Alfred P. Sloan, president of the United Motors Corp., New York. C. W. Stiger, James H. Foster, T. J. Wetzels and W. O. Rutherford were re-elected directors to serve for 3 years. The present board of directors includes these men and Alfred P. Sloan, T. W. Beach, Christian Girl, William C. Rands, William M. Sweet and L. M. Bradley, manager. The Rowe Calk Mfg. Co., Hartford, Conn., was elected to membership.

### N. A. C. C. Men Off to Shows

NEW YORK, Jan. 15—Sam Miles, manager of the national shows, will leave for Chicago on Wednesday to superintend the Chicago show. Alfred Reeves, general manager of the National Automobile Chamber of Commerce, will leave later in the week, and from Chicago will go to San Francisco in response to the invitation of the show managers of that city that the N. A. C. C. be represented at their exhibition. While on the Coast Mr. Reeves will visit dealers in the principal cities in connection with manufacturers' co-operation.

### Ten Broeck Tire Business Doubled

LOUISVILLE, KY., Jan. 13—After re-electing the officers and directors for another year, stockholders of the Ten Broeck Tyre Co., at their annual meeting, authorized the officers to install at once in the tire plant at Twenty-sixth and Courtney Streets a cotton mill plant, in which to spin yarn and weave fabrics for the company.

The company's business during 1916 was more than double that of 1915.

H. L. Lewman continues as president. Other officers are Fred Haupt, vice-president; W. N. Cox, treasurer, and W. C. Lewman, secretary and general manager. The officers, with F. E. Trumpter, constitute the board of directors.

### Salon Sales Increase 100 Per Cent

NEW YORK, Jan. 12—Sales of cars at this year's Automobile Salon, which closed last night, show an increase of 100 per cent over a year ago. From the opening on Jan. 2 up to Tuesday night sales amounted to \$400,000. Sales are expected to pass the \$500,000 mark. Attendance has been 50 per cent ahead of any previous year.

### Canton Auto Parts Co. Formed

CANTON, OHIO, Jan. 12—The Canton Auto Parts Co. has been formed to manufacture a piston ring, invented by Stewart Kurtz, 16 years old. The company is capitalized at \$100,000 and will employ 700 men.

## Gasoline 1 to 2 Cents Higher

### Advanced in Pennsylvania, Alabama, Oklahoma, Arkansas and Other States

NEW YORK, Jan. 13—Gasoline prices throughout the country are gradually being adjusted to the higher scale started 2 weeks ago by the Standard Oil Co. and the independents. This week's advances embrace such territories as Pittsburgh, Oklahoma, Alabama, Mississippi, New Mexico, Arkansas and Louisiana.

The Atlantic Refining Co. has advanced gasoline prices as follows in Pittsburgh: automobile grade, 25 cents, 68-70 deg. to 28 cents, 73-76 deg. to 32 cents a gallon. Previous prices for the three grades were 25, 27 and 29 cents, respectively.

The Texas Co. has advanced the price of gasoline 1 cent a gallon in the following States, the new prices being: Oklahoma, 22 cents; Alabama maximum, 26 cents, minimum 22½ cents; Mississippi maximum 23½ cents, minimum 21½ cents. Kerosene has been advanced ½ cent a gallon in New Mexico. This company has advanced prices in Arkansas and Louisiana 2½ cents a gallon. The maximum and minimum prices there now are: Arkansas, 23½ and 23; Louisiana, 23 and 21 cents.

Gasoline has been advanced 1 cent in New Jersey and 2 cents per gallon in Delaware and Pennsylvania. The tank wagon basis in New Jersey is now 21 cents, while in the other two States it is 23 cents. It is stated that indications point toward an increase in the Metropolitan district within the next week, owing to the increase in the price of crude oil.

The Standard Oil Co. of Indiana has advanced gasoline ½ cent a gallon to 19 cents, tank wagon basis, in its entire territory. Kansas City prices have been advanced 1 cent a gallon to 18.8 cents, tank wagon basis, a record price for this city.

### To Protect Pullman Assets

YORK, PA., Jan. 12—William A. Keyworth, Carlton L. Hoff and Henry D. Schmidt, all of York, Pa., were appointed receivers for the assets in all parts of the United States of the Pullman Motor Car Co., in the United States District Court at Williamsport yesterday.

### Tracy Succeeds McDearmond with Oakland

PONTIAC, MICH., Jan. 13—W. R. Tracy has become assistant sales manager of the Oakland Motor Car Co., this city. He succeeds Thomas H. McDearmond, who has joined the George P. Miller Co., Oakland dealer in Madison, Wis.



## Munitions Co. To Build Engines

Amalgamated Machine Corp.,  
Ammunition Machine Maker,  
Overhead-Valve Design

CHICAGO, ILL., Jan. 15—The Amalgamated Machine Corp., this city, is turning its plant partly over to the production of engines and will have a new type of overhead-valve engine at the show. This company is one of the largest makers of machines for producing ammunition.

### Cadwallader Elected Seneca Pres.

FOSTORIA, OHIO, Jan. 11—At a meeting to-day of the Seneca Motor Car Co., formerly the Fostoria Light Car Co., Ira Cadwallader was elected president, Charles Ash vice-president and J. H. Jones secretary-treasurer, with Alexander Kiskadden of Tiffin, P. H. Brown of Toledo and C. D. Whitelaw of Findlay, as directors.

### Elliott and Johnston with Smith

CHICAGO, Jan. 16—Eugene Elliott has been appointed general eastern sales manager of the Smith Form-A-Truck Co. and A. F. Johnston has been made general western sales manager. Mr. Elliott was formerly production manager for the Haynes Automobile Co., Kokomo, Ind.; and Mr. Johnston was sales manager of the Automatic Carbureter Co.

A new plan of distribution has been completed by the company. All the territory is to be divided into a number of major blocks, each under a manager with sub-division under from four to eight factory representatives and service managers.

### Jenkins Heads Four Drive Tractor

DETROIT, Jan. 15—The Four Drive Tractor Co. held its annual meeting last week and elected E. J. Jenkins, R. Fitch, Dr. W. H. Taylor, G. Fitch, J. C. Jenkins and A. Johnson as directors. Officers elected were E. J. Jenkins, president; J. Allen, vice-president; A. Johnson, secretary and treasurer. The company plans to manufacture tractors at once.

### Tire Companies Complain of Discrimination in Freight Rates

WASHINGTON, D. C., Jan. 16—The McGraw Tire & Rubber Co., East Palestine, Ohio, has filed with the Interstate Commerce Commission a complaint against the Pennsylvania Co., and about twenty other railroad companies in which it is alleged that rates charged under Southern Classification tariffs effective July 10, 1916, and in previous issues, on rub-

ber tires are excessive, unfair, and discriminatory.

The complaint recites that these rates apply to pneumatic rubber tires, to rubber pneumatic inner tubes, and solid rubber tires, mounted. It also recites that higher rates are charged under the classification in question on articles mentioned from East Palestine to Jacksonville and Atlanta, than to Havana, Cuba, via Atlanta, Jacksonville or Key West.

An investigation by the commission, with relief, is asked. The Kelly-Springfield Tire Co., Akron, Ohio, also has filed complaint with the Commerce Commission protesting against rates charged on rubber tires from either Akron, or Cumberland, Md., for southern destinations, in either mixed or straight shipments. Relief and reparation are asked, and the commission also is requested to fix rates in maxima on such shipments from Akron and Cumberland to the southern classification points.

### Chamber of Commerce to Discuss Industrial Relations

WASHINGTON, D. C., Jan. 13—National defense will be discussed at the fifth annual meeting of the Chamber of Commerce of the United States, 2 weeks hence. Among the speakers will be Howard E. Coffin of the Naval Consulting Board, and Maj.-Gen. Leonard A. Wood.

Another entire session will be devoted to the subject of industrial relations and still another to conditions after the war, divided into four aspects: Business conditions, financial conditions, transportation and education for foreign trade.

The secretary of commerce will speak on trade preparations after the war: W. D. Simmons, president of the Simmons Hardware Co., on education for foreign trade and others will discuss subjects in this section.

The sessions will begin Jan. 31 and end Feb. 2.

### Acme Tire Prices Higher

TRENTON, Jan. 15—The Acme Rubber Mfg. Co., this city, has raised its tire prices from 15 to 20 per cent, effective to-day. The 30 by 3½, formerly \$16.50, is \$19; the 32 by 4 has been increased from \$23.90 to \$27.50; and the 36 by 4½ from \$32.60 to \$42.30. The tube prices have also been affected by a proportionate increase. The 30 by 3½ size has been increased from \$4.10 to \$4.50; the 32 by 4, \$5.30 to \$5.80; and the 36 by 4½, \$7.30 to \$8.

### Fletcher Leaves National Machine

DETROIT, Jan. 15—M. B. Fletcher, general manager of the National Machine Products Co., has resigned and will announce his new appointment in the near future.

## U. S. Rubber Co. Refinancing

\$60,000,000 Bonds Bought by  
Kuhn, Loeb & Co. for  
Larger Working Capital

NEW YORK, Jan. 13—Negotiations have been completed covering the purchase of \$60,000,000 first and refunding mortgage 5 per cent bonds of the United States Rubber Co., to cover all existing bonds and liens upon the properties of the company and to provide larger working capital. By the new financial arrangement, Kuhn, Loeb & Co. have begun the formation of a syndicate to underwrite the issue. With them will be associated the American International Corp.

W. S. Kies, vice-president of the American International Corp.; C. B. Seger, vice-president of the Union Pacific Railroad Co., and J. S. Alexander, president of the National Bank of Commerce, New York, will be elected directors of the company. Mr. Seger and Alexander, it is understood, will represent Kuhn, Loeb & Co.'s interests. The three men will be added to the board and will not succeed present directors.

Part of the proceeds from the sale of the bonds will be used to retire \$24,697,148 of obligations outstanding of the parent company and subsidiaries. All the existing obligations will be paid on or before Dec. 1, 1918, except \$2,600,000 6 per cent gold bonds of the Canadian Consolidated Rubber Co., maturing in 1946, and \$9,000,000 debentures of the General Rubber Co., due Dec. 1, 1918. The latter will be left undisturbed for the present, as the company has under consideration other plans for dealing with its crude rubber interests.

The company is not to pay any dividend on the common stock other than a dividend in common stock, unless unencumbered quick assets of the company and subsidiaries after deducting therefrom such dividends shall then exceed the aggregate debt of the company and subsidiaries, including outstanding bonds.

Last year's sales of the company and its subsidiaries are estimated at \$125,000,000, a new record. Net earnings for 1916 are estimated at \$12,500,000, a new high mark, as compared with \$11,539,313 for 1915.

Quick assets of the company over and above all liabilities, after applying the proceeds of the new bond issue, it is stated, would be \$81,363,402, and total funded debt, including the new \$60,000,000 issue only \$71,600,000, thus leaving an excess of assets of \$10,000,000. The 1916 earnings applicable to the common

stock were nearly double the highest rate of dividends ever paid on the stock, which was 6 per cent.

It is understood that the bonds will be offered for public subscription at 97.

#### Globe Motor Truck Co. Formed

ST. LOUIS, Mo., Jan. 15—The Globe Motor Truck Co. has been organized here and will be incorporated this week with a capital of \$200,000. The following, all St. Louis men, were elected directors: J. F. Hines, chairman, Christopher Brockmeyer, Jr., W. H. Corcoran, Louis Fusz, D. A. Marks, W. C. Miehler and G. E. Raithel. J. H. Eddy and F. N. Woodward of the Globe Motor Truck Co., Detroit, with a plant at Northville, a suburb of that city, attended the organization. The local company has taken over the plant of the National Iron Works and will begin manufacture early in February.

#### Rubber Club Re-elects Officers and Executives

NEW YORK, Jan. 13—The Rubber Club of America re-elected its officers and executives at its annual meeting this week. The name of the club was changed to that of the Rubber Assn. of America.

The officers are as follows: President, H. S. Firestone, president of the Firestone Tire & Rubber Co.; Van H. Cartmell, of the Kelly-Springfield Tire Co.; H. S. Hotchkiss, of the U. S. Rubber Co., and H. S. Vorhis, sec.-treas.

The executive committee is composed of the following: H. S. Firestone, chairman; G. B. Hodgman, of the Hodgman Rubber Co.; Van H. Cartmell, H. S. Hotchkiss, W. E. Bruyn, of L. Littlejohn Co., New York, and P. W. Litchfield, of the Goodyear Tire & Rubber Co.

The directors are as follows: W. E. Bruyn, Van H. Cartmell, H. S. Firestone, H. S. Hotchkiss, W. J. Kelly, of Arnold & Zeiff, New York; P. W. Litchfield, J. S. Lowman, of the Philadelphia Rubber Works Co., Akron; W. Rutherford, B. F. Goodrich Co., C. T. Wilson, of C. T. Wilson Co., New York; Tracy Lewis, of Beacon Falls Rubber Shoe Co., Beacon Falls, Conn.; J. A. Lambert, of Acme Rubber Mfg. Co., Trenton, N. J., and C. A. Daniel, of the Quaker City Rubber Co., Philadelphia.

#### No Substitution of Trucks for Mail Tubes

WASHINGTON, D. C., Jan. 15—The House of Representatives has defeated the recommendation of the Postmaster General and the House post-office committee that delivery of mail by pneumatic tubes in Boston, Chicago, St. Louis and Philadelphia be entirely eliminated, and materially curtailed in New York City, and that the use of motor trucks for delivery purposes be substituted for the tubes.

## Fiat To Ship Two Racers

### To Compete in Indianapolis Meet May 30—Have Been Under Test for a Year

PARIS, Jan. 14—*Special Cable*—The decision of the Fiat company of Turin, Italy, to enter two Fiat racing cars at the Indianapolis meet Decoration Day, May 30, this year, is conclusive proof that European countries have not lost interest in the automobile industry in America and that they are anxious to maintain their former prestige in America. It has been known for some time that Fiat has been developing new racing cars and that these have been under test for the past year. They have been given severe usage for months, the Fiat pursuing its former policy of severe testing.

It is known here that other concerns are much interested in the American speedway racing circuit but that war conditions have made it impossible for them to build special cars. The details of the new Fiats are not yet available.

#### Hearn Reinstated by Contest Board

NEW YORK, Jan. 15—Eddie Hearn was reinstated by the Contest Board of the American Automobile Association at its meeting last Wednesday. His reinstatement becomes effective July 12, providing he does not compete in any outlaw races up to that time. Hearn will drive two cars this year.

#### Disbrow Builds Two Racers

NEW YORK, Jan. 13—Louis Disbrow is making a display in this city of two new racing cars built by him and which he will use on the tracks this year. Two T-head Wisconsin engines of 60 and 90 hp., respectively, are used.

#### May Run Vanderbilt Race on Long Island Course

NEW YORK, Jan. 16—The Vanderbilt Cup race may be brought back to the East. A committee has been appointed to consider ways and means of bringing this about, and if it can be satisfactorily arranged the race may again be run over a Long Island course. The matter first came up for discussion at a luncheon tendered to Dr. H. M. Rowe, president of the American Automobile Assn., by Robert Lee Morrell, president of the Metropolitan Consulate of the A.A.A. Later a committee was appointed to consider the possibility of bringing the race East and to make individual investigations concerning conditions which have made it necessary that the race be held on the Pacific Coast. The committee

consists of Robert Lee Morrell, Jefferson De Mont Thompson and William Schimpf, all ex-chairmen of the Contest Board; Richard Kennerdell, present chairman, Frank G. Webb and Robert Graves. To date little progress has been made, though it is confidently expected that with the active co-operation of dealers and factories something of a definite nature may be done in the near future. The committee is to meet again in the course of a week or 10 days.

#### American Speedways Assn. Re-Elects Officers

NEW YORK, Jan. 14—The American Speedways Assn., at its meeting in this city last week, re-elected its officers for the coming year. A meeting will be held Feb. 1 in Chicago at which all business matters will be discussed. The officers of the association are as follows: president, Harry Harkness, New York Speedway; vice-president, Allison, Indianapolis Speedway; treasurer, H. S. Lehman, Cincinnati Speedway; and secretary, T. E. Meyers, Indianapolis.

#### Mulford Leaves Hudson

DETROIT, Jan. 15—Ralph Mulford has resigned from the Hudson Motor Car Co., this city. He is at present negotiating with a Cleveland automobile company. Mulford drove Hudson cars in the prominent speedway events last year and competed in the Pike's Peak hillclimb. He also set up several new records on the speedway.

#### Studebaker Buys Staver Plant

DETROIT, Jan. 15—The Studebaker Corp. has completed the purchase of the Staver Carriage Co. plant in Chicago, and will use it for assembling automobiles. This plant covers the block between West Seventy-sixth and West Seventy-seventh Streets, between the Rock Island Lines on the east and the Chicago Belt Lines on the west. The buildings are four stories and contain approximately 300,000 sq. ft. of floor-space.

#### Parker Rust-Proof Buys Patents

DETROIT, Jan. 17—The Parker Rust-Proof Co. of America, this city, has completed negotiations for the purchase of the Thomas Watt Coslett, Coslettizing patents, Nos. 870,937 and 1,007,069 and all other improvements, which may hereafter be made in rust-proofing by Mr. Coslett. This company also owns five other patents covering the rust-proofing art, as follows: Richards, No. 1,069,903, dated Aug. 12, 1913; Allen, No. 1,206,075, Nov. 28, 1916; Allen, No. 1,167,966, Jan. 11, 1916; Parker, No. 1,185,343, May 30, 1916; and Parker, No. 1,211,218 Jan. 2, 1917.

## Urge Passage of Webb Bill

### U. S. Chamber of Commerce Committee Wants Amendment Eliminated

WASHINGTON, D. C., Jan. 13—A special committee of the Chamber of Commerce of the United States, appointed for that purpose, has filed with the Senate committee on interstate and foreign commerce a report urging the passage of the Webb bill at this session of Congress. The report recommends that the amendment made in the House, to prevent the exemptions from the Sherman Act taking effect if there is restraint upon the export trade of the United States, be eliminated.

The committee stated that this amendment would have the effect, should the bill finally pass, of nullifying the whole purpose of the legislation.

Discussing the report submitted, the Commerce Chamber committee said that the passage of the Webb bill would, especially, prove of advantage to small concerns now doing business abroad, many of which, not having had great experience in foreign fields, are now unwittingly doing harm to American commerce abroad.

#### Erickson Wheel Corp. Formed

DOVER, DEL., Jan. 13—The Erickson Wheel Corp. has been formed to manufacture automobile wheels. Its capitalization is \$5,000,000. The incorporators are: A. B. Wilson, East Weehawken; J. W. Mitchell and C. W. Gould, New York.

#### Saginaw Co. Elects Officers

SAGINAW, Jan. 15—The stockholders of the Saginaw Motor Car Co., builders of the Yale 8, held a meeting late last week and elected officers and new directors. Officers are: J. A. Cimmerer, president; J. W. Grant, vice-president; W. C. Weichman, secretary; H. L. Oppen-

heimer, treasurer; L. J. Lampke, general manager. C. F. Bach, J. L. Geyer and E. C. Leipprandt were added to the board of directors which also includes the officers mentioned, and B. G. Appleby, E. L. Beach, M. N. Brady, O. L. Dittmar, E. C. Forrest, J. R. Liebermann and H. Witters. The company plans to produce a new roadster model.

#### Wagner Electric Capital \$5,000,000

ST. LOUIS, Mo., Jan. 15—The Wagner Electric Co. of this city, has voted to increase the capital of the company from \$2,000,000 to \$5,000,000. This company has been growing steadily for several years and during most of 1916 was engaged in munition making. Recently this contract was completed and the forces so engaged turned to making automobile starters. W. A. Layman was re-elected president.

#### Standard Steel Tube Capital \$600,000

TOLEDO, Jan. 12—The Standard Steel Tube Co. increased its capital stock from \$150,000 to \$600,000 this week. The increase was made to secure additional working capital. All of the old officers and directors were re-elected.

#### Oakes Capital \$450,000

INDIANAPOLIS, IND., Jan. 11—The Oakes Co., maker of automobile accessories, has increased its capital from \$250,000 to \$450,000.

#### Standard Screw Products Capital \$250,000

DETROIT, Jan. 12—The Standard Screw Products Co., this city, which manufactures screw parts for automobiles, has increased its capital from \$100,000 to \$250,000.

#### Columbia Truck Increases Capital

PONTIAC, MICH., Jan. 16—The Columbia Motor Truck & Trailer Co. will increase its capital from \$35,000 to \$100,000. Officers elected include: F. G. Clark, president and treasurer; Frank Carroll, vice-president, and Leigh Lynch, secretary. More than 400 orders have already been received for 1917.

## Freight Car Shortage Decrease 50%

### Situation Greatly Improved Since November—Shortage Only 59,891 Cars Dec. 31

NEW YORK, Jan. 17—The shortage of freight cars has decreased almost 50 per cent since last November, when the situation was very serious. Due to co-operative efforts of the Interstate Commerce Commission, shippers and the railroads, the shortage has been met with emergency measures and with success. Progress has been made in getting cars out of the congested districts into the territory where they are most needed.

The American Railway Assn., which has represented the railway interests by a special committee, reports that since Nov. 1, when there was a shortage of 114,908 freight cars, the shortage has fallen to 107,778 Dec. 1, and to 59,892 Dec. 31.

The number of freight cars owned by the railroads of the country has increased from July 1, 1907, to July 1, 1916, from 1,840,009 to 2,518,855. Figures given by the American Railway Assn. show that for the whole period of nearly 9 years preceding the middle of last August, there had been a continuous net surplusage of cars not in use on American railroads except for about 1 month in 1909, 3 months in 1912, 1 month in 1913, and the month of March last year.

#### Anti-Friction Lubricant Elects Officers

ST. JOSEPH, MICH., Jan. 12—The Anti-Friction Lubricant Co. held a meeting of stockholders this week and elected new officers. These include J. J. Theisen, president; F. Hildebrand, vice-president; E. P. Clarke, secretary, and B. Rimes, treasurer. The board of directors includes E. P. Clarke, Edward Burton, J. J. Theisen, W. A. Feather and F. Hildebrand.

#### Aluminum Drops 2 Cents

NEW YORK, Jan. 17—The automobile materials market was featured this week with a drop in price of 2 cents for aluminum, now quoting at 58 cents a pound. Copper prices are higher, electrolytic and lake grades quoting at 28½ cents a pound. Rubber prices were steady during the week. Ceylon closed on Monday at 76, a drop of 2½ cents a pound. Oils were steady.

#### Lee to Handle Sales Direct

CONSHOHOCKEN, PA., Jan. 17—Beginning Feb. 1, the Lee Rubber & Tire Co., this city, will handle its sales direct from the factory instead of through the Kelly-Field Co., New York, which has been the

### Daily Market Reports for the Past Week

Material	Tues.	Wed.	Thurs.	Fri.	Sat.	Mon.	Week's Changes
Aluminum, lb.	.60	.60	.60	.60	.60	.58	-.02
Antimony, lb.	.14½	.14½	.14½	.14½	.14½	.14½	...
Beams and Channels, 100 lb.	3.62	3.62	3.62	3.62	3.62	3.62	...
Bessemer Steel, ton	60.00	60.00	60.00	60.00	60.00	60.00	...
Copper, Elec., lb.	.27	.27	.27½	.28	.28	.28½	+.01½
Copper, Lake, lb.	.27½	.27½	.27¾	.28	.28	.28½	+.01
Cottonseed Oil, bbl.	12.35	12.30	12.22	12.07	12.12	12.15	-.20
Fish Oil, Menhaden, Brown, gal.	.73	.73	.73	.73	.73	.73	...
Gasoline, Auto, bbl.	.22	.22	.22	.22	.22	.22	...
Lard Oil, prime, gal.	1.30	1.30	1.30	1.30	1.30	1.30	...
Lead, 100 lb.	7.50	7.50	7.50	7.50	7.50	7.70	+.20
Linseed Oil, gal.	.93	.93	.93	.93	.93	.93	...
Open-Heart Steel, ton	60.00	60.00	60.00	60.00	60.00	60.00	...
Petroleum, bbl., Kan., crude	1.70	1.70	1.70	1.70	1.70	1.70	...
Petroleum, bbl., Pa., crude	3.05	3.05	3.05	3.05	3.05	3.05	...
Rapeseed Oil, refined, gal.	1.00	1.00	1.00	1.00	1.00	1.00	...
Rubber, Fine Up River Para	.77½	.77½	.77½	.77½	.77½	.77½	...
Rubber, Ceylon, First Latex, lb.	.78½	.78½	.78½	.75	.76	.76	-.02½
Sulphuric Acid, 60 Baume	1.50	1.50	1.50	1.50	1.50	1.50	...
Tin, 100 lb.	42.75	42.80	42.88	42.88	42.88	44.13	+1.38
Tire Scrap, lb.	.06½	.06½	.06½	.06½	.06½	.06½	...

sales agent. Harry Field, owner of the New York sales company, has sold it to the Lee company and will himself remain with the local company in general charge of sales of the new department.

**Mitchell-Lewis Redeems Bonds**

DETROIT, Jan. 15—All of the outstanding bonds of the Mitchell-Lewis Motor Co., Racine, Wis., have been called for payment at 102 and interest, by S. W. Straus & Co. The bonds, secured by a first mortgage on the land, buildings and equipment, were dated Aug. 1, 1914. The first serial payment of \$50,000 was made Aug. 1, 1915, and the second of \$75,000 was made Aug. 1, 1916. The amount of \$175,000 is outstanding.

**Amazon Names New Official Board**

AKRON, OHIO, Jan. 13—Stockholders of the Amazon Tire & Rubber Co. elected the following directors at their annual meeting: L. J. Schott, L. F. Smith, C. E. Bettler and Dr. F. B. Richards of Akron and Albert Kroehle of Cleveland. The directors named these officers: L. J. Schott, president and secretary; L. F. Smith, vice-president, and C. E. Bettler, treasurer.

**Western Carburetor Co. Incorporated**

LANSING, MICH., Jan. 12—The Western Carburetor Co. of Alma, Mich., has been incorporated for \$100,000.

**Dividends Declared**

Nash Motor Co., quarterly of 1% per cent on preferred, payable Feb. 1 to holders of record Jan. 20.

**Break in Automobile Securities**

**Bears Attack General Motors and Other Stocks—U. S. Rubber a Feature**

NEW YORK, Jan. 17—Although the automobile stock market showed a fractional recovery yesterday from the previous depression, the market as a whole is not anywhere near as big as it was before the peace scare was announced. This week, in the face of the statement that sales of automobiles were running far ahead of last year, automobile issues found little market. General Motors dropped 14 points on three successive days, showing a net decline of 50 points to 500, the quotation on the old stock and to 103 on the new stock, which is equal to 515 on the old stock.

Profit-taking has been behind the recent decline of most of the automobile stocks. General Motors, however, has been up to this time immune from bear attacks, but with the disappointing declaration of a \$1 quarterly dividend, the stock has gradually come down in price. It would seem that dividends rather than earning power were dictating the market price of the stock.

United States Rubber prices were affected in the same way as General Motors. On the announcement of the new bond issue the common dropped 6 points from the previous close, the drop being ascribed in some quarters to the provision in the agreement with the bank-

ers that the company shall not pay any dividend on common stock, unless unincumbered quick assets of the company and subsidiaries, after deducting therefrom such dividend, shall then exceed the aggregate debt of the company and subsidiaries, including outstanding bonds.

Chevrolet Motors, which once sold at 290, touched par on Monday. The next day it pulled up to 102, and closed at a net loss for the week of 22 points.

**National Rubber Stock Offering**

POTTSTOWN, PA., Jan. 13—The National Rubber Co., this city, is offering its common stock for investment. The stock is being sold at \$12.50 a share, now drawing 8 per cent. It is full profit sharing, carrying voting power and is non-assessable.

This company has been in existence 4 years and has grown in that time nearly 1000 per cent. It has a new five-story cement, steel and glass factory, of which two floors are completed and in operation.

**Kent Stock for Subscription**

NEW YORK, Jan. 13—The Kent Motors Corp., this city, is offering 25,000 shares of stock for subscription at \$6.50 per share. The capital stock of the company is 200,000 shares full paid and non-assessable, par value \$10 each. Nagel & Simpson, 1270 Broadway, are managers of the underwriting syndicate.

This company has invested over \$232,000, having purchased 16½ acres of ground at Bellville, N. J., valued at \$85,000, and is at present building its plant, which will cost about \$300,000.

**Automobile Securities Quotations on the New York and Detroit Exchanges**

	Bid	Asked	Net Ch'ge		Bid	Asked	Net Ch'ge
Ajax Rubber Co.	70	72	..	Standard Motor Construction Co.	5½	6½	+ ½
J. I. Case T. M. Co. pfd.	86½	89	..	Stewart-Warner Speed. Corp. com.	99½	100	+ ½
Chalmers Motor Co. com.	30	34	..	*Studebaker Corp. com.	104½	105½	..
Chalmers Motor Co. pfd.	..	..	..	*Studebaker Corp. pfd.	108½	109½	+ 1½
*Chandler Motor Car Co.	97½	98½	-3	Swinehart Tire & Rubber Co.	78	83	..
Chevrolet Motor Co.	102	106	-22	United Motors Corp.	41½	42½	-3¼
Fisher Body Corp.	37½	40	..	*U. S. Rubber Co. com.	59½	59½	-3¼
Fisk Rubber Co. com.	80	85	+5	*U. S. Rubber Co. pfd.	109	110	-3½
Fisk Rubber Co. 1st pfd.	110	115	..	White Motor Co.	49	49	+ ½
Fisk Rubber Co. 2d pfd.	90	100	..	*Willys-Overland Co. com.	35¾	36	-1¼
Firestone Tire & Rubber Co. com.	148	151	..	*Willys-Overland Co. pfd.	96½	97	..
Firestone Tire & Rubber Co. pfd.	106	107	..				
*General Motors Co. com.	500	800	-50				
*General Motors Co. pfd.	119	123	-1				
*B. F. Goodrich Co. com.	55½	55½	-2½				
*B. F. Goodrich Co. pfd.	..	111	..				
Goodyear Tire & Rubber Co. com.	280	284	+2				
Goodyear Tire & Rubber Co. pfd.	107½	108	+ ¼				
Grant Motor Car Corp.	5	8	-1				
Hupp Motor Car Corp. com.	3	4	..				
Hupp Motor Car Corp. pfd.	..	..	..				
International Motor Co. com.	16	18	..				
International Motor Co. pfd.	..	..	..				
*Kelly-Springfield Tire Co. com.	57	60	-3½				
*Kelly-Springfield Tire Co. 1st pfd.	90	95	-2				
*Lee Rubber & Tire Corp.	23	24	..				
*Maxwell Motor Co. com.	53½	53½	+2½				
*Maxwell Motor Co. 1st pfd.	71	72	+ ½				
*Maxwell Motor Co. 2d pfd.	36	37	-1				
Miller Rubber Co. com.	247	251	..				
Miller Rubber Co. pfd.	106	107	..				
Packard Motor Car Co. com.	165	173	..				
Packard Motor Car Co. pfd.	101½	..	+ ½				
Paige-Detroit Motor Car Co.	40	40½	+ ½				
Peerless Truck & Motor Corp.	16	18	..				
Portage Rubber Co. com.	168	172	..				
Portage Rubber Co. pfd.	..	..	..				
Regal Motor Car Co. pfd.	26	..	..				
Reo Motor Car Co.	37½	39½	-1				
Saxon Motor Car Corp.	64	66	-1½				
Springfield Body Corp. com.	75	90	..				
Springfield Body Corp. pfd.	110	120	..				

\*At close Jan. 15, 1917. Listed New York Stock Exchange.

**OFFICIAL QUOTATIONS ON THE DETROIT STOCK EXCHANGE**

**ACTIVE STOCKS**

	Bid	Asked	Net Ch'ge
Auto Body Co.	44½	46¼	..
Chalmers Motor Co. com.	..	125	..
Chalmers Motor Co. pfd.	..	..	..
Continental Motor Co. com.	39½	39¾	-2¼
Continental Motor Co. pfd.	9½	..	..
Ford Motor Co. of Canada.	250	270	-12
General Motors Co. com.	..	..	..
General Motors Co. pfd.	..	..	..
Maxwell Motor Co. com.	50	52½	..
Maxwell Motor Co. 1st pfd.	..	..	..
Maxwell Motor Co. 2d pfd.	..	..	..
Packard Motor Car Co. com.	..	169	..
Packard Motor Car Co. pfd.	101	103	- ½
Paige-Detroit Motor Car Co.	39½	40¼	- ½
W. K. Prudden Co.	49½	50	- ½
Reo Motor Car Co.	37	37½	- ½
Studebaker Corp. com.	103	106	-2
Studebaker Corp. pfd.	..	..	..
C. M. Hall Lamp Co.	30	33	..

**INACTIVE STOCKS**

	Bid	Asked	Net Ch'ge
Atlas Drop Forge Co.	35½	38½	+1½
Kelsey Wheel Co.	50	..	..
Regal Motor Car Co. pfd.	27	..	..

Three buildings have already been completed, namely, the body plant, the machinery and the assembling plants. The fourth, a metal working plant, is now in course of construction. The company has material and merchandise on hand and paid for valued at \$80,000. The value of the machinery and tools installed and producing is \$27,000.

The company, it is stated, has orders on hand and applications for 60,000 cars at a factory profit of \$95 per car, which means an estimated profit of \$1,425,000 for the first year's business. A profit of over 75 per cent on its entire \$2,000,000 capital.

#### Trucks on Exhibition During Show

NEW YORK, Jan. 15—Several motor truck exhibits were maintained in New York last week, as no trucks were admitted to the national automobile show. Four years ago motor truck shows were discontinued on the grounds that they did not pay, but this year a number of truck manufacturers and makers of converters rented exhibition space in hotels and vacant stores.

The Hurlburt Motor Truck Co. of New York showed its 3½- and 5-ton chassis at quarters in the Hotel Biltmore. The Maxwell company exhibited its 1-tonner at this hotel. The Fulton Motor Truck Co., Farmingdale, N. Y., had its new 1½-tonner on view in one of the parlors of the Waldorf-Astoria. The Autocar had space at the Martinique. The Hurd had quarters in the Long Beach Building on Lexington Avenue across from the Grand Central Palace. A number of salesmen represented adapters attached to Fords and Rush and Vim light trucks stationed on the street outside the show quarters.

#### Will Fight New York Truck Legislation

NEW YORK, Jan. 16—The Automobile Trade Assn. of New York State at its annual meeting on Jan. 11 at the Engineers' Club tentatively agreed to exert its influence against the motor truck fee bill, which would greatly increase registration fees on commercial vehicles.

E. M. Alling was elected president of the association. He is president of the Automobile Dealers' Assn., Rochester, N. Y. Other officers elected were: Vice-president, E. V. Stratton, president of the Albany Automobile Dealers' Assn.; treasurer, E. G. Oliver, Hudson-Oliver Co., Buffalo, and secretary and general manager, Charles A. Stewart.

#### Collins Resigns from Stromberg

CHICAGO, Jan. 17—C. R. Collins, advertising manager of the Stromberg Carbureter Co. of America, has resigned to become advertising manager of the Racine Rubber Co., Racine, Wis., effective Jan. 22. His successor has not been named.

## U. S. Aeronautical Exhibit

### Army, Navy, Standards and Weather Bureaus Depts. To Be Represented

NEW YORK, Jan. 14—The United States Government will have an elaborate exhibit at the first Pan-American Aeronautics Exposition to be held in Grand Central Palace, Feb. 8-15. The War Department, the United States Army, including the aviation section; the United States Navy, the Bureau of Standards, the Weather Bureau and the United States geodetic survey are among the departments to be represented.

The method of intercommunication between aircraft on the European front will be demonstrated. Lieut.-Col. George D. Squier, chief of the aviation section of the Naval Corps, will be present with his staff during the week of the show.

Howard Coffin, chairman of the show committee; Augustus Post, of the Aero Club of America, and Rich G. Hollaman, president of the International Exposition Co., with others representing aeronautic societies, visited Washington last week to go over plans with the Government department executives.

Considerable additional space was contracted for last week. Joseph A. Steinmetz, inventor of the Steinmetz trailer, which enables aeroplanes to land on ships at sea, has arranged for an exhibit at the show.

#### Chevrolet Dealers to Hold Convention at Oakland

OAKLAND, CAL., Jan. 11—There is to be a convention of the Chevrolet dealers of the Pacific Coast held at Oakland while the automobile show is on at San Francisco. The 200 or more dealers from all over the territory tributary to the factory located in this city are to attend the convention together with many of their agents. The convention is to open the same day as the Pacific Coast Auto Show, and on opening night the dealers at the convention are to attend the show in a body after a dinner tendered by the officers of the factory.

#### Truck Interests Banquet at Milwaukee

MILWAUKEE, WIS., Jan. 15—R. M. Dobson, special representative of the Kelly-Springfield Motor Truck Co., tendered a banquet to commercial vehicle men who exhibited at the Milwaukee show, Jan. 5 to 11, to promote mutual interests and a stronger feeling of friendship. Mr. Dobson's guests included H. M. Rosenberg, district sales manager, Federal Motor Truck Co.; Oscar Stegeman, president, Stegeman

Motor Car Co., Milwaukee; I. E. Clark, Goodrich Rubber & Tire Co.; L. P. Helm, sales manager, Wisconsin Motor Truck Co.; J. A. DeVoy, state distributor, Gramm-Bernstein Truck Co.; E. K. Wagner, Milwaukee sales manager, Menominee (Mich.) Motor Truck Co.; L. P. Fortin, sales manager, Menominee Motor Truck Co.; L. H. Blaney, district manager, Service Motor Truck Co.; George Barrowman, state representative, International Motor Co.; H. B. Willower, assistant sales manager, Gramm-Bernstein Truck Co.; William P. Evans, special representative, Standard Sanitary Mfg. Co.

#### Two Automobile Bills in New York

ALBANY, N. Y., Jan. 16—Automobile headlights and the reduction of the minimum age limit of an automobile driver were brought up to-day in bills introduced by Assemblyman Harding Showers and J. D. Kelly, respectively. The Showers bill provides that automobile headlights shall not throw dazzling rays more than 3½ ft. above the ground on a level road. The Kelly bill provides that the highway law shall be amended to allow persons over 16 years of age to operate a car and not make 18 years the minimum legal age, as at present.

#### Leavitt Takes on Harroun and Premier

NEW YORK, Jan. 13—J. W. Leavitt & Co., San Francisco, Cal., has completed negotiations at the local show to distribute the Harroun, Columbia and Premier on the Pacific Coast. The Harroun territory will cover California, Nevada and Arizona. The Premier territory given Leavitt will embrace the lower half of that State and practically all Nevada. The Leach Motor Car Co., Los Angeles, handles the other half of the State and practically all of Arizona.

#### Champion Meeting Jan. 20

TOLEDO, Jan. 12—Makers of automobiles and accessories from all parts of the country will attend the third annual get-together meeting of the Champion Spark Plug Co., Jan. 20. More than 800 invitations have been issued.

#### Harry Newman Forms New Company

ST. LOUIS, Jan. 12—Harry Newman has formed a company known as Harry Newman, Inc., in this city to handle the KisselKar.

#### Oldsmobile Eight Is 2½ by 4¼

NEW YORK, Jan. 15—In THE AUTOMOBILE for Dec. 28 a typographical error made it appear that the bore of the eight-cylinder Oldsmobile engine is 2½ in. This should have been 2¾. The stroke of the engine, 4¼ in., was correctly given.



Ninth annual banquet of the Motor Accessories Manufacturers held at the Waldorf-Astoria Wednesday evening, Jan. 10. There were over 500 in attendance

## 70,259 Attend Milwaukee Show

Dealers Expect to Sell 38,500 to 40,000 Cars in Wis. in 1917

MILWAUKEE, WIS., Jan. 12—The official attendance at the ninth annual Milwaukee automobile show, which was held in the Auditorium from Jan. 5 to 11, inclusive, was 70,259, compared with 41,440 in 1916, a gain of 28,819, or nearly 70 per cent. Paid admissions also increased to a remarkable extent, being nearly one-half of the total attendance. All exhibitors declare the show to have been unusually successful in all ways.

The tenth annual show will be held somewhat later in January, 1918, than this year, to avoid conflict with the New York exposition.

The largest truck exhibited at the show was a 7-ton Stegeman, with worm drive, which featured the display of the Stegeman Motor Car Co., Milwaukee. The car, complete with body, as exhibited, weighed 13,122 lb. The rear tires had a combined width of 32 in.

Wisconsin distributors expect to place an aggregate of 38,500 to 40,000 cars in the Badger State for 1917. During 1916, this state absorbed 35,860 cars, an increase of 44 per cent over 1915. The total number registered by private owners was 115,650. The number sold in Wisconsin last year was more than all of the cars in use in this state in 1913, which was 34,646.

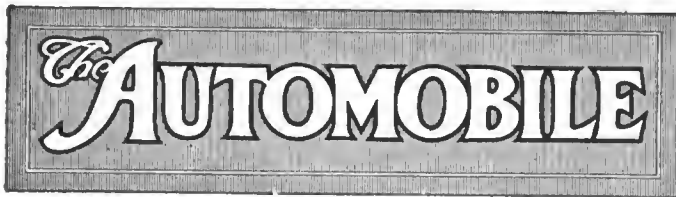
It is estimated that 75 per cent of the total number of 1970 dealers in Wisconsin attended the show. This year the Milwaukee Automobile Dealers, Inc., which manages the show, dispensed with the annual banquet in honor of state dealers because no suitable banquet hall could be found to accommodate the large crowd, and also because practically every factory and distributor entertained its dealers at banquets during show week.

### Orders 1200 Redden Truck-Makers

NEW YORK, Jan. 15—Negotiations are being completed in a deal whereby one of the largest automobile dealers in Texas contracts for 1200 Redden Truck-Makers, representing a total value of about \$420,000. These units, which are manufactured by the Redden Motor Truck Co., Detroit, are designed to convert Ford chassis for truck use. The Texas firm plans to establish agencies.

### Pinkerton Joins Chalmers

DETROIT, Jan. 15—R. D. Pinkerton, formerly an officer in the British army, has joined the Chalmers company and will have charge of a zone.



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**Smoothing the Way**

FOR a device to exert an influence great enough to bring it to the rank of a factor in civilization it has to have two supreme qualifications: It must be eminently practical and it must be within the reach of the mass of humanity. The greater the degree to which these two fundamental qualities are possessed, the greater the movement. This is the lesson that above all we must learn, and which we must set up as a standard if we are to carry through to its justifiable conclusion the great movement upon which we have embarked.

As milestones in the industry the annual shows offer us a natural resting point to stop and observe the results of the journey. The way has become smoother as we have gone along. The first few miles of the journey as measured by the annual pauses were accompanied by many great questions and uncertainties, and it is only within the last 3 years that the industry seems to be emerging into the light where a clean-cut set of fundamentals can be set down as representative of what is desired. Once the aims are known definitely, half the battle is over, and in a review of the seventeenth annual show it is not a difficult matter to see the way in which we are traveling.

Each year the number of car novelties have been dropping off, and yet the variety of invention is in no way less. The lines along which to work have become more clearly defined. It is hard to associate a small gasoline power plant with a world-wide

movement, and yet it is the increasing multiplicity of these little power units scattered all over the face of the earth that has magnified this achievement of science into the rank of a mold of the lives of men. Looking back from 1999 the change in conditions due to mechanical road transport will be seen as at least as great as the change due to railways was obvious in looking back over the nineteenth century.

**Detail Progress**

IT does not require a number of developments of a radical nature to constitute progress. The seventeenth annual show offers no long list of surprises of a mechanical or decorative nature, and yet it is certainly indicative of a broad movement that denotes an important period of progress.

Without exception every car in the show illustrated some little improvement in one point or another as compared with the design of a year ago. This is true of the cars in the lower end of the price scale as well as in those in the upper end. Taking all these together, the story of advancement is made up.

When the fundamental is so clearly established as it seems to be in the basic ideas of automobile design, it is the detail that is necessary to acquire the efficiency which is the ultimate aim. To be concrete, take the many small improvements which have been made to meet the descending grade of fuel. No one car incorporates all the improvements made in this direction, and yet looking at 1917 cars as a whole the lower grade fuel is being handled better than the higher grades of a decade ago. The amalgamation of these scattered details into common practice are just as important as a measure of progress as the introduction of an entirely new principle. In fact, they are more important, because whatever the principles the details will always be with us.

**S A. E. High-Pressure Sessions**

THE 1-day winter meeting of the Society of Automobile Engineers proved an unquestionable success. On Thursday last the business session in the morning and the professional session in the afternoon went with a swing from start to finish. The big auditorium in the Engineering Societies Building was well filled; those who spoke, spoke to the point, and there was practically no wasted time whatever. Of course, everything was condensed to the limit. The Standards Committee chairmen read only such parts of their reports as required the society's confirmation, eliminating the reading of progress matters.

The papers were, in each case, presented by their authors with a minimum of words, and very clearly and concisely. The society has been working for months to make the winter meeting the most successful ever held, and all those connected with the arrangement deserve the heartiest congratulations for their success.

# Best Winter Meeting

S. A. E's Last Gathering Under Present Name Exceeds All Expectations—Professional Sessions Carried Out with Snap and Vim

By J. Edward Schipper

**N**EW YORK CITY, Jan. 12—Yesterday brought to a close the most eventful year in the history of the Society of Automobile Engineers. It was S. A. E. day, and starting with the business meeting in the morning, the professional session in the afternoon and ending with the banquet and entertainment in the evening the members and their friends made an occasion that fittingly brought to a close the last meeting of the Society of Automobile Engineers that will ever be held.

When the time for the next mid-summer session rolls around, it will be a new and broader society with a new and broader name. The Society of Automotive Engineers, whose field of endeavor is as broad as the art of self-propelled transportation through the air and over water and land, will succeed it. It only remains for the confirmation of a mail vote to put this into effect.

With the new era come new officers who will carry on the work of their predecessors in the broadened fields. Standardization of the aircraft, the tractor and in the motor marine field will engage a new and broadened standards committee. Professional papers and research work will likewise proceed on a much wider scope.

George W. Dunham, consulting engineer, is the new president of the society. Jesse G. Vincent, vice-president of the Packard Motor Car Co., is first vice-president; Charles M. Manly, is second vice-president. The new members of the council are B. B. Bachman, engineer of the Autocar Co., H. L. Horning, engineer of the Waukesha Motor Co., C. W. McKinley, engineer of the Willys-Overland Co., and F. E. Moskovics, commercial manager, Nordyke Marmon Co. Herbert Chase, assistant manager of the S. A. E., is treasurer of the society.

President Huff's address opened the meeting. He spoke of the successful year which the society has just passed through and of the bright outlook for the future, particularly since the merging of the other automotive societies has been practically consummated. Members of the other organizations are to be permitted to enter the S. A. E. at any time after the date of ratification for a period of 3 months, without the payment of initiation fees.

Another great feature of the society's work as mentioned by Mr. Huff is the increased co-operation with the government. This is a phase of the work which has been growing rapidly and presages a closer connection between the endeavors of the society and those of governmental activities in similar directions. The particular work in which members of the society are assisting the government is the drawing up of standard truck specifications and on the aeronautical division of the standards committee. The society is also in

close touch with the bureau of standards in Washington.

President Huff spoke of the increase in membership of the society, which now has passed the 2000 mark. In January, 1916, there were 1783 members. The total for January, 1917, is 2120, without counting thirty-five additional applications which have just been accepted.

The growth of the standards work is worthy of comment. It had its inception in 1910 and at that time a number of the members of the S. A. E. contributed out of their own pockets to guarantee the work. In 1916 the budget allowed \$7,500 for standards work and the actual cost was \$10,000 and in 1917 it is likely that the expenditures along this line will exceed \$14,000. The financial condition of the society is indicated from the fact that there is a total surplus on hand of \$30,490.

Some of the other business to come before the society at the business meeting which followed President Huff's address concerned constitutional amendments was the matter of change of name, revision of the council to take in the aeronautic and tractor fields, succession of officers and a constitutional revision committee to have in charge such matters and thereby prevent loss of time at the semi-annual meetings. All these were passed along for further consideration and in addition the proposed membership for army and navy officers at reduced fees was tabled.

## Standards Committee Business

Nine reports from different divisions of the standards committee were heard and of these eight were accepted in toto and the other, that of the tire and rim division, in part. These will now be passed on by the council and put before the membership of the society for a mail vote before they become accepted standards or recommended practice as the case may be. The reports appeared in THE AUTOMOBILE last week.

The divisions which presented reports were those dealing with aeronautic engines, electrical equipment, electric vehicles, engines and transmissions, iron and steel, miscellaneous parts and fittings, springs, tires and rims and trucks. Little discussion developed on any of the reports except that on the tires and rims. The tire and rim division has had under consideration for the last few years a set of standard loads for solid truck tires. There has been considerable difficulty in reconciling the different tire manufacturers to these loads and the table arrived at in the report represented about the best compromise that could be effected. That it does not meet



GEORGE W. DUNHAM  
New president of the Society of Automobile Engineers

## Engineering Work During Show Week

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the ideas of everyone, however, is the immediate cause of its being turned over to the truck standards division for review. The outcome of this action is awaited with great interest by the standards committee, as it presages other important work along this same line in the passenger car tire field.

**Accepted Without Discussion**

The reports of the electric equipment division, A. L. Riker, chairman; the electric vehicle division, A. J. Slade, chairman; engine and transmission division, E. T. Fishleigh, chairman; iron and steel, K. W. Zimmerschied, chairman; miscellaneous division, J. G. Utz, chairman; springs division, C. W. McKinley, chairman; and the truck standards division, W. P. Kennedy, chairman; were all accepted without discussion. The scope of these divisions are denoted by their names and their particular activities were reported in THE AUTOMOBILE for Jan. 11.

A little discussion developed on the report of the aeronautical engine division on the recommendation of the tapered shaft fitting for propellers. The report covered this feature, spark plugs and a definition in connection with direction of engine rotation.

At the October meeting of the standards committee this division reported in favor of recommending spark plugs having 18 mm. threads for use with aeronautic engines. This report was approved by the standards committee but was referred back to the division by the council, asking for more complete detail dimensions.

Accordingly the division has prepared dimensions as shown on the sketch presented herewith. The thread dimensions correspond with those adopted in Great Britain by the engineering standards committee. No limits have been placed on the pitch diameter of the thread by the engineering standards committee.

Considerable discussion developed on the question of whether metric or English dimensions should be used. In spite of a vote in favor of metric dimensions at the October meeting of the division, several of the members were reluctant to adopt them. It was thought that the question was one of too great importance to be decided out of hand in a division meeting, and that it should be discussed and decided by the standards committee or the council or both.

In order that the proposed standard for spark plugs might be placed on record, dimensions in both millimeters and inches have been provided, the closeness of the equivalents being determined by the degree of accuracy required in the different dimensions.

The design follows the same general lines as the S. A. E. large hex. plug, but the gasket seat and size of hexagon are



C. M. MANLY  
Curtiss Aeroplane Co.  
Second vice-president S. A. E.

Left—J. G. VINCENT  
Vice-president of engineering  
Packard Motor Car Co.  
First vice-president S. A. E.

26 mm. (approximately 1 in.) instead of 1 1/2 in., this giving an ample gasket seat in connection with the 18 mm. thread.

In addition to the dimensions given in the present S. A. E. standard for spark plug with 7/8 in. thread, a limiting dimension has been placed on the height of the plug above the gasket seat, and a definite dimension has been given from the gasket seat to the lower end of the spark plug shell.

In connection with the proposed spark plug standard the division recommends that in every case the tapped hole into which the spark plug is screwed should be counterbored slightly to approximately the outside diameter of the spark plug thread.

**Aeronautic Engine Supports**

The division recommends three sets of dimensions for bed timbers for supporting engines and aeroplanes. No standardization is thought possible in regard to fore and aft length. The dimensions recommended are as follows, in inches:

Distance between timbers .....	12	14	16
Width of bed timbers .....	1 1/2	1 1/4	2
Distance between centers of bolts	13 1/2	15 1/4	18

**Propeller Hub Dimensions**

At the October meeting of the standards committee, the division proposed for acceptance a tapered shaft end for mounting propeller hubs but this proposal was not voted upon. Since that time additional reports have been received from France and from New Mexico, to the effect that the tapered and keyed fitting for propeller hubs is giving perfect satisfaction.

The division therefore submits for adoption as recommended practice practically the same dimensions as were submitted at the October meeting, the only difference being that the proportion of the tapered length to be relieved has been reduced somewhat. Most of the dimensions are given in the English equivalents of the metric dimensions used in France, but may be translated back to metric dimensions if this policy shall be preferred.

The division is not prepared yet to recommend dimensions for hub flanges, etc., but the aviation section of the signal corps will submit drawings suggesting different sizes of hubs.

**Direction of Engine Rotation**

At the October meeting of the standards committee the division reported definitions of terms for direction of engine rotation. The national advisory committee for aeronautics did not concur in these definitions in its report on nomenclature, and since printing that report has revised its own first definitions.

Because of lack of agreement with the national advisory



B. B. BACHMAN  
Engineer Autocar Co.  
New member of S. A. E.  
council



H. L. HORNING  
Engineer and general manager  
Wauseka Motor Co  
New member of S. A. E. council



**F. E. MOSKOVICS**  
Commercial manager Nordyke & Marmon Co.  
New member S. A. E. council



Right—**HERBERT CHASE**  
Assistant manager S. A. E.  
Treasurer of the society

committee the council of the society referred the definitions back to the division. The division has reconsidered the matter and is not thoroughly satisfied with any of the definitions proposed. It has accordingly prepared new definitions for direction of engine rotation, making use of the terms "normal" and "anti-normal" in place of the terms which have formerly been used and have caused confusion.

**Report of Aeronautic Engine Division**

Charles Manly stated that there is great need to standardize the tapered shaft as soon as possible, although there is considerable likelihood that there will be a change. "We are just learning," he said, "that the larger horsepowers are giving trouble. We need data on the larger engines on these fittings as it is necessary in order to make them that we cut into the shaft quite brutally; especially with the hollow type of shaft. With these fittings we cannot guarantee that the shaft will not have to be replaced." An advantage in the taper fitting pointed out by Mr. Manly is that there are no patent complications to be met.

In using the tapered fit Mr. Manly pointed out that the French lap the fitting by putting emery and oil on the hub and lap in the connection with the keys out. After a good fit has been obtained the keys are then inserted. One of the difficulties which must be avoided is the tendency for the shaft to blister under stresses set up by misalignment.

Others speaking on the use of the taper fitting questioned the wisdom of reducing the shaft in the center, stating that a machined hub will give a good fit for the entire length. It was also suggested that it would be better to separate the keys and to see that both keys take the same amount of load. With the proper precautions a 1 3/8-in. shaft was said to be able to transmit a load of 200 hp. at 1100 r.p.m.

E. H. Ehrman, factory manager of the Chicago Screw Co., commented on the spark plug standard suggested and stated that further precautions should be taken in interpreting the metric and inch dimensions and that in the case of pitch it would be better not to mention the inch dimension at all. The report was accepted as recommended practice.

**Tire and Rim Discussion**

The tire and rim discussion which filled its expected part on the program of being the most-discussed issue on the books, hinged about the recommended standard table of tire carrying capacities of solid rubber tires. This table follows:

Nominal Width of Tire, In.	Gross Load Per Wheel in Pounds	
	Tire Diameter, 36 In. and Under	Tire Diameter, 40 In. and Over
3	1,000	.....
3 1/2	1,300	.....
4	1,700	.....
5	2,500	2,600
6	3,300	3,500
7	4,200	4,500

This is a subject which has been under consideration in various divisions for many years, during which it has been reviewed repeatedly without being able to make any final specific recommendations up to this time. Recent discussions have taken cognizance of present practice in this field and in formulating this table a special effort has been made to base it upon the best available engineering information in the hands of the tire companies. The above table represents the only compromise acceptable to a majority of the tire companies. This schedule if agreed to rationally, and if not abused by overloading will give very satisfactory tire life.

John Younger, chief engineer motor truck department of the Pierce-Arrow Motor Car Co., opposed the table on the ground that it did not coincide with practice. He gave as a specific example the 6-in. size which he said was many hundred pounds under weights which are ordinarily being carried.

C. B. Whittelsey, factory manager of the Hartford Rubber Works, said that the committee had been working on this table for 5 years, and the allowances made are from 50 to 1200 lb. greater than other ratings. In other words, the tire companies are more liberal on these ratings than they have been in any other table ever compiled.

J. E. Hale, experimental engineer of the Goodyear Tire & Rubber Co., seconded Mr. Whittelsey's remarks and said there is no sharp dividing line between the points where tires are under and overloaded. The reputable truck companies are careful and there is less undertiring than in the past. He cited the fact that the 4-in. dual was formerly considered sufficient for the 3-ton truck, whereas this is now equipped with 5-in duals as common practice. It is realized, he stated, that the more adequate the tire equipment, the less the cost to the truck user.

B. B. Bachman, engineer of the Autocar Co., asked if the figures in the table were arrived at through a mere compromise on the parts of the tire companies or through engineering tests that would justify their use.

K. W. Zimmerschied, engineer of the General Motors Co., replied that the Goodrich and Goodyear companies both submitted elaborate sets of data as compiled by tests. He also stated that the truck standards committee had asked permission to review these figures on account of impending legislation on the allowable amount of wheel load.

George Green, chief engineer of the Fifth Avenue Coach Co., said that speaking from the experience of 1,000,000 miles of travel for his vehicles he has found that an allowable load on the 4 in. size of 1931 lb. instead of 1700 lb. had been very satisfactory, keeping the cost of tires down to 1 cent per mile.

The allowable load part of the report was turned over to the truck standards division as requested with the other parts of the report accepted. The accepted portion of the report was



**C. W. MCKINLEY**  
Engineer Willys-Overland Co.  
New member of the council



**J. G. UTZ**  
Perfection Spring Co.  
Chairman Standards Committee



**E. H. EHRMAN**  
Secretary and factory manager  
Chicago Screw Co.



**C. T. SCHAEFER**  
Chief engineer Militaire Motor  
Vehicle Co.

reviewed in THE AUTOMOBILE for Jan. 11 in the report of the standards committee's session.

The afternoon session was opened promptly, the president calling upon Capt. D. E. Clark, chief aeronautic engineer, U. S. Army, to present a paper on problems in aeroplane construction written by himself, Capt. T. F. Dodd and Mr. O. E. Strahlmann. In connection with this Captain Clark showed a number of moving pictures and lantern slides illustrating aircraft of various kinds engaged in war work in Europe and on the Mexican border. These films had never been exhibited publicly and were of an extremely vivid sort. The paper was reviewed briefly in the last issue of THE AUTOMOBILE, and there was no discussion upon it at the meeting.

#### Horning Speaks on Tractor Engines

H. L. Horning, engineer of the Waukesha Motor Co., who was down on the program for a paper entitled the Ultimate Type of Tractor Engine, did not read his paper, but instead, delivered a rather illuminating address on the subject.

Mr. Horning said that nothing since the discovery that a hook on the end of a pole would aid in the art of agriculture, had promised to benefit man to such an extent. It will be a factor in reducing the high cost of living. The value of land may be appreciated when it is mentioned that it takes 4 acres to keep a horse alive for a year. The tractor is a workhorse and not a racehorse and unlike the aero engine which must be overhauled every 120 hr. the tractor engine must keep on indefinitely in spite of abuse.

The use of passenger cars by farmers is helping to educate them mechanically in the use of tractors, but it is surprising to note the degree of care that has to be given to the endurance of the tractor: For instance, it was discovered that a greasless type of bearing worked out very well at one point but it was impossible to use it simply for the reason that if the bearing ever did wear out it would be impossible to replace it. The V-belt is a satisfactory device but it had to be abandoned in place of the flat belt because the latter is so much easier to repair.

The tractor engine must have the ability to keep on going. And it must keep on going under difficulties that are enormous. Take the matter of oiling which is so important. Yet instead of getting the proper oil the tractor is apt to get the product of mail order houses which is anything but correct. In one case it was found that a farmer had been using linseed oil in his engine. The use of kerosene also reduces the viscosity of the oil with the result that the rings in the top groove wear three times as rapidly as those in the lower ones. Mr. Horning said he had seen rings wear out in 2 days

while working at 106 deg. in the shade in a Kansas dust cloud. As much as ½ in. of dirt is not infrequent in the crankcase.

In securing efficiency the speed of the engine and the attainment of higher mean effective pressures are the cardinal points. The design of the combustion chamber must be watched and numerous pockets and solid parts to cool must be avoided.

#### Engine Works at Maximum Speed

What the tractor engine has to work against may be seen when the farmers' method of regulating speed is known. He will sink his plow and if it is too deep, cutting the speed of the tractor down too far he will lift it a little so that the desired speed is attained. In other words the engine is working constantly at maximum torque speed. In every way this is the most difficult work that can be put on this type of engine as it represents constant wide open throttle work, or what would be parallel in automobile practice to a car that is climbing a grade constantly at the highest possible speed at which it can be made to negotiate the hill.

The cooling of the spark plug must be carefully watched and the waterjackets arranged so that a vertical flow of heat will be maintained down the valve stem. Eighty per cent of the troubles are around the exhaust port and the flow of heat on the valve is down the stem from the center of the valve head. The matter of the valve seat is a compromise. If the seat is too narrow the valve will not cool and if it is too wide carbon will form on account of the excessive cooling.

In speaking of the results accomplished in the laboratory Mr. Horning said that he had been able to secure with tractor engines a performance equal in car practice to 42,000 miles of travel at 45 m.p.h. up the steepest hill that the car could climb at that speed.

As features of design he said the bottom of the crankcase is very important as it must take the heat away from the main bearings. On pistons interior ribbing is beneficial. With good design Mr. Horning states that he has been able to run at 98 lb. per sq. in. brake m.e.p. without pounding.

The chief contributor to the discussion on Mr. Horning's paper was R. E. Davis, chief engineer of the J. I. Case T. M. Co. Mr. Davis said that having had experience with many kinds of tractors and tractor engines he found himself in a general way in very close agreement with Mr. Horning. Most of the difficulties and troubles mentioned by the author he has himself encountered, and in his opinion they would be overcome in much the way that Mr. Horning suggested.

A request was made for fuller information regarding the formula given in the paper, and in reply Mr. Horning said it would be hardly possible to do this as it was an empirical formula derived from careful examination of all the data they had been able to suggest. It was pointed out that this formula called for a higher average speed in a tractor engine than is obtained in an ordinary automobile motor, and this, Mr. Horning stated, was regarded by him as essentially true.



**F. HYMANS**  
Presented a paper on dynamic  
balancing of rotating parts



**N. W. AKIMOFF**  
Read a paper on proportions in  
spring suspension



C. F. SCOTT  
Commercial manager Sprague  
Electric Works  
Left—J. E. HALE  
Experimental engineer Goodyear  
Tire & Rubber Co.

much superior to previous machines. He said that with the older form, to obtain successful crankshaft balancing, it is necessary to find a man with some gift for the job. If he fell sick or was absent from the factory for any cause, it simply meant that no crankshafts were balanced until he returned or another man was trained. Even a skillful man could not work very fast with the old machine. On the other hand, the Akimoff machine gave absolute information and it required hardly any skill or experience to balance crankshafts satisfactorily. Obtaining the proper balance would, in an ordinary way, take about 15 min., and getting static balance was now more troublesome than getting dynamic balance, according to Mr. Roos.

The last paper of the day was Prof. W. T. Fishleigh's, describing the tests made at the Michigan University to return the amount of heat value in the fuel wasted by an ordinary engine. He briefly recapitulated the main points of the paper as was done in THE AUTOMOBILE last week, and stated that the test he had made encouraged him very much to go further with other types of engine. In fact, the whole course of work was mapped out for the present year.

A tractor engine is worked under the hardest conditions of all since the demands upon it are practically as heavy as those on an aviation engine, while it receives no consideration and no expert attention.

The next paper was that describing the Akimoff balancing machine. The author, F. Hymans of the Otis Elevator Co., drew some diagrams on the blackboard explaining the operation of the machine. His address was almost identical in substance with the digest of the paper published in the last issue of THE AUTOMOBILE.

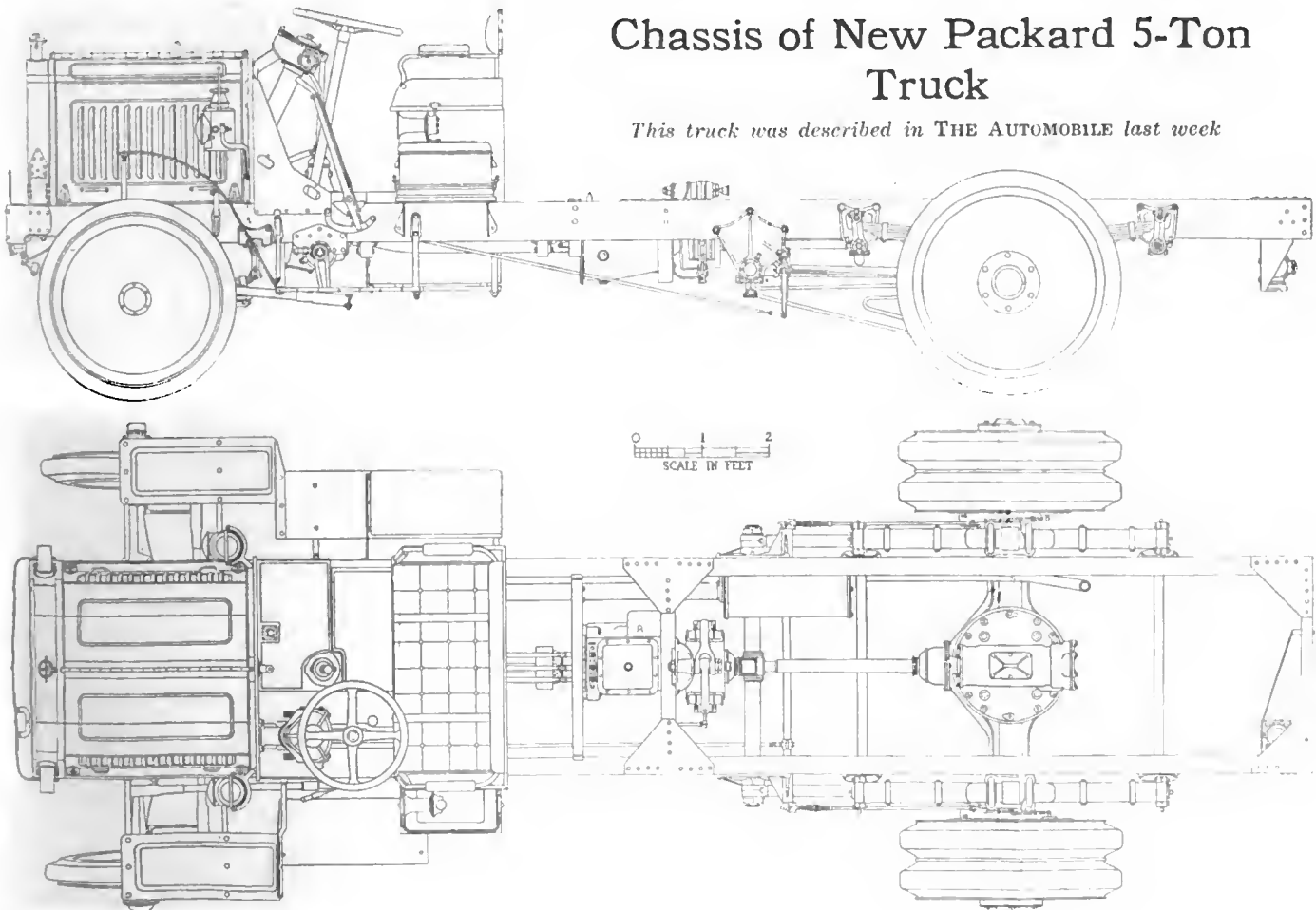
D. G. Roos, experimental engineer of the Locomobile Co. of America, said that they had had an Akimoff machine in use in the factory for some months and had found it very

Several written discussions have been received on this paper largely dealing with other tests which showed conclusions similar to Professor Fishleigh's. The general conclusion appeared to be that these tests showed the enormous price that had to be paid for "reserve power," otherwise to obtain a reasonable fuel efficiency we must use smaller engines and not expect them to produce high torque at very low speeds. If the combustion engine is not improved in some way in its application to automobile service it will be possible for the steam engine to beat it on economy and equal it on performance.

The meeting concluded promptly on schedule, the remaining papers being taken by title.

## Chassis of New Packard 5-Ton Truck

*This truck was described in THE AUTOMOBILE last week*



## Annual Banquet of Society of Automobile Engineers



**T**HE Society of Automobile Engineers held its last annual banquet under the present name in the grand ballroom of the Hotel Biltmore, Thursday evening, Jan. 11. When the organization convenes again it will be under the name of the Society of Automotive Engineers. Among the speakers were John Barrett, director-general of the Pan-American Union, who spoke on Pan-Americanism; Its Great Trade Opportunities, and Howard E. Coffin, vice-president of the Hudson Motor Car Co., and member of the Naval Consulting Board, who reviewed national defense,

# Poor Methods Handicap Sales in Australia

- ¶ Direct Representation Is Essential to Success of U. S. A. Accessories.
- ¶ U. S. A. Makers Too Frequently Appoint Sole Agents for All Australia, Getting No Results.
- ¶ Must Consider Country as Five Separate Divisions.
- ¶ Preferential Tariff Is the Main Obstacle to U. S. A. Goods.
- ¶ Some American Firms Well Established.

**S**YDNEY, AUSTRALIA, Nov. 10—Methods pursued by U. S. A. automobile and accessory manufacturers doing business in Australia are in general better than those with other countries, but many U. S. A. accessories and cars are being practically held out of the Australian trade because of poor methods. Very frequently exclusive contracts are given to Australians not in the automobile industry and all they do is collect discounts, perhaps place an agency or so, and put the price of the article so much higher than corresponding articles from Europe as to hurt the sale.

One large American vehicle manufacturer placed the entire agency with a concern not connected with the automobile industry and the only good that can possibly come out of it is the agency for this party. The same has happened with another well-known American car which established the agency 3 years ago and has not placed a single agent in the country.

## Should Deal Direct

Australian business men are large enough and the Australian trade big enough so that U. S. A. manufacturers should deal direct, that is, sell direct to the Australian houses. Too frequently U. S. A. makers sell to what are known as "indent" houses. An indent house is known here as a clearing house, but there is a distinction between the two. A clearing house generally charges about 2½ per cent commission, whereas an indent firm will take as much commission as it can get.

A keen Australian business man must be held in his own sphere on a par with a good U. S. A. business man. It is just as likely as not that if Australia had the population of U. S. A. its big business men would equal those of the United States in the same magnitude of business. To draw a parallel: Could you imagine a man like John Wanamaker purchasing goods from any other country through a clearing house or indent house? It is just as impossible to imagine many of our large Australian houses doing business with the U. S. A. in the same manner.

## Five Different Divisions

With U. S. A. automobile and accessory concerns doing business in Australia it is first essential that they recognize Australia as five different divisions with each division under the government of a capital town. These five divisions are the various states of the continent, namely; New South Wales, Victoria, Queensland, South Australia and Western Australia.

Further: Do not forget that New Zealand is not Australia or anything connected with it, it has an entirely separate government and home rule on its own account, goods leaving

Australia are dutiable when entering New Zealand and vice versa. New Zealand merchants do not trade with Australia to any great extent as far as importing wares goes.

The greatest mistake an American manufacturer makes is when he appoints an agent to represent his interests solely throughout Australia and New Zealand. The manufacturers believe that this is one country with one business center, but as a matter of fact none of the capital cities in Australia care to accept a sub-agency and this is exactly what the American manufacturer is trying to do.

## Many Indent Merchants

For example, Sydney and Melbourne are the two leading cities of Australia, but they are as independent as New York and Chicago; in fact, they are more so as there is a political jealousy existing between the two. These cities are full of indent merchants, few of whom have any capital standing, these indent merchants considering their ends only and nothing for the manufacturer. They will scour all publications carrying advertisements for catchy lines and they will write to the various manufacturers seeking the sole agency for Australia, they have no intimate knowledge of the trade, but are generally commission merchants in the true sense of the word. They write to the manufacturers and ask for the agency of their wares for the whole of Australasia and New Zealand, they give no order with their request, immediately they receive a favorable reply they write to the leading houses all over Australia and offer a certain discount far less than that which the manufacturer gives the indent merchant. Now as the indent merchant has no idea of a fair discount he takes the first discount offered by the manufacturer, but he has no knowledge of competing lines by which he can use as a guide for the judgment of discounts. When the retail man is eventually reached the discount offered to him is insufficient inducement for him to take up the selling agency.

Things are totally different with European markets, the European manufacturers of goods generally send their own factory representative out looking for the proper agents and more often than not the principal of a firm in Europe may be ordered away for 6 months' rest by his medical adviser and he conducts an Australasian tour, he comes here and gets hold of the right people and he has to quote the right prices to get the business, so you can easily see there is a big difference in their methods of appointing agents.

## Preferential Tariff Main Obstacle

The greatest obstacle the American manufacturer has to overcome is preferential tariff, which is in favor of the United Kingdom. This varies from 10 to 33 1/3 per cent on most

goods relating to automobiles. For example: Chassis parts throughout are 10 per cent higher dutiable on American goods over these from the United Kingdom and rubber goods carry 33 1-3 per cent. An English chassis is allowed to come into the Commonwealth free, whereas the foreign tariff is 10 per cent.

Tires carry British duty to 36 cents per pound weight or 25 per cent ad valorem duty, whichever happens to be the greater, whereas foreign tariff is 48 cents per pound or 35 per cent ad valorem.

This must be borne in mind, as it is a serious handicap to the foreign manufacturers of accessories. Then again the American manufacturer is a very bad shipper. He understands in his own country all about the railroad workings, but shipping goods overseas is totally foreign to him.

#### Quote Best Discount First

The average American merchant does not in the first instance quote his best discount, this leaving the price of the product high as the buyer out here is so used to getting the best discount from England in the first instance that he does not think to ask for a better one from America.

Another detrimental thing the American manufacturer is inclined to do, that is, he will let the sole control of the agency to some English firm which, in turn, looks for a representative over the seas. This means three or four profits before it gets into the hands of the retailer; that is, the English house has to make a profit as the distributing center, then in turn it gets in touch with some wholesale house in Australia, and as the big Australian dealers will not deal via England, this simply means two agents' profits to be paid before the retailer gets hold of the goods.

Another feature of the American manufacturer, he will readily place the foreign representation of his goods in the hands of some American distributing house which house asks for too big a profit to insure good representation in this country, and further than that, the leading Australian accessory houses have learned that they can only profitably trade by dealing direct.

#### Some U. S. A. Firms Have Done Well

Another reason the American goods are not represented so well as they might be is the fact that an Australian merchant who has a desire to take a business trip around the world will commence by going to England first and will spend more time there than anticipated and consequently he has to cut short or cut out altogether his visit to America. It is easily seen that the American manufacturers are at a disadvantage again until we get proper representation such as direct factory representatives armed with the best discounts calling on the best houses in Australia or deal through some big shipping or indent firm in U. S. A. with its Australian office, who will do business on a small commission basis of about 1 to 2½ per cent. There are a few such firms existent in U. S. A. who will undertake this class of business.

Some U. S. A. firms have handled their export trade with Australia remarkably well. One of the best examples is the Goodyear tire, which practically controls the market here. You scarcely see a car in Australia that has not a Goodyear tire on it and frequently all five are Goodyears. Goodyear went about the business properly, sending a man from the factory to look for suitable agents and, not finding any, opened direct factory branches in the five capital cities of the commonwealth. The campaign has been followed up with a strong advertising appropriation.

Other American firms have established themselves strongly in the Australian market. In the accessory field the Stewart products are a good example. They are well and properly represented in every state of the commonwealth and their export business has been well handled.

There is a good opportunity here for U. S. A. accessory firms manufacturing lamps. To-day the lamp market is prac-

tically held by English houses. The U. S. A. lamps do not appeal to the public as they should. Many U. S. A. lamps are represented here but their business has not been properly handled.

#### Battery Field Is Large

There is a big opportunity for U. S. A. firms manufacturing storage batteries. Starting and lighting battery business is best represented here by Willard. The battery business is going to be a huge thing like tires, and the battery firm that gives the best service, not only in the five capital cities, but also in the country towns, is going to have the best trade, irrespective of the selling price. It means that the battery firm represented throughout the country with batteries ready for immediate use and charged so that the man who has a failure of battery knows he can buy a new one straight away is going to be the leading battery representative.

In the field of engine and hand tire pump most of the trade in hand pumps is handled by English and the engine pumps by Americans. The Kellogg pump has made best progress here, which is due to a successful method of introduction. The whole Australian business is placed in the hands of a New York firm whose Australian office does a large indent business. This firm has gone to the agents of each make of car and has offered, them the sole agency of the Kellogg pump for that particular car, namely, the Overland people have the sole agency for Overlands and so with Buick, Hupmobile, etc. This method is proving very successful.

Some of the U. S. A. best vulcanizer makers are badly represented here, and as a result some English makes are the biggest sellers. For cheaper cars the U. S. A. vulcanizers are holding their own but they have not that percentage of the trade which good business would give them.

In various other lines of accessories the market is split between Europe and U. S. A. There is a field for increased sale for U. S. A. goods in every line. The speedometer field is practically controlled by the Stewart products. Previous to the war Europe controlled the magneto situation but now some U. S. A. products are working in. Bowser has practically an absolute monopoly of the garage gasoline tank situation. Owing to springs paying a 45 per cent duty it is almost prohibited to enforce them. Special Ford radiators are just coming on the market, being introduced by one American concern. Air compressors and portable pumps for garages are all made in Australia. Chains for motor trucks are largely controlled by the English makers. Hexagon nuts, lock washers, bolts, etc., all come from the English market. The best lifting jack trade is in the hands of English manufacturers. The clock market is divided between English and U. S. A. firms. In the carburetor field, the Schebler is in good hands and so is the Master, but outside of these U. S. A. carburetors are not selling.

#### Makers Lose Opportunities

There are some very peculiar things happening in the selling of U. S. A. automobile accessories in Australia which show that the manufacturers are not at all familiar with the field, as otherwise they would not do such inexcusable bungling. An example is a spark plug maker. Australian houses had been importing these spark plugs from the factory and had been receiving them at reasonable prices. For some unknown reason this factory has left the agency to an indent firm in Australia which is looking for indent orders. The discount now is only about one half and consequently Australian dealers who have been purchasing this spark plug direct are not going to buy any more.

The shock absorber field is largely controlled by U. S. A. makers. In the anti-skid chain business England has 90 per cent of the trade and the remaining 10 per cent split among the different U. S. A. makers. There is a small trade in tire carriers and supports, but the most of these are manufactured locally.

# Attack Headlight Glare Problem

Symposium Under Auspices of Society of Illuminating Engineers Brings Out Statements by Engineering, Manufacturing, Legislative and Police Authorities Showing Present Unsatisfactory Conditions

NEW YORK CITY, Jan. 11—A symposium on the headlight glare situation was held last night at the Engineering Societies building under the auspices of the Society of Illuminating Engineers. The subject was discussed from all angles, both technical and legislative as well as from the common sense standpoint of the ordinary user of automobiles.

The discussion was started by a paper by F. W. Little of the Electrical Testing Laboratories, entitled A Survey of the Automobile Headlight Situation. In connection with the paper a number of the leading devices on the market were demonstrated by actual illumination after which the meeting was opened to a discussion by authorities representing the different classes interested in headlight glare. Those who spoke were as follows: Dr. Louis Bell, consulting engineer; Hon. W. L. Dill, commissioner of licenses, State of New Jersey; Deputy Commissioner L. B. Dunham, police department, New York; Dr. H. P. Page, Corning Glass Works, Corning, N. Y.; James Hemstreet, American Automobile Assn.; A. L. McMurtry, Society of Automobile Engineers; Dr. C. H. Sharp, Electrical Testing Laboratories and Prof. C. W. Waggoner, West Virginia University.

The paper by Mr. Little was really a classification and a definition of the construction and operation of headlights. The author states in part that:

The main problem in headlight design is that of applying the light effectively for driving purposes without producing glare. The angle which separates this useful light upon the roadway from that which would produce glare is very small. Also assuming that it is possible and practicable to keep all of the light below a plane passing through the headlight axes, the inequalities in the roadbed would cause this plane to shift to the extent of producing glare when the headlights point upward, and producing but little useful light when they point downward. A balance should be secured between objectionable glare on the one hand and useful driving light on the other.

### Requirements for Design

In order to obtain opinions concerning the requirements for headlight design, questions were sent to a number of men who have given thought to the subject. Several of these have very kindly given their views, which are summarized in the accompanying table.

It must be understood that the table shown herewith does not represent a fixed opinion on the part of any of the participants. Most answers as received were qualified by such expressions as "In my mind there is no one ideal distribution characteristic for automobile headlights." "Conditions are different in city and country driving," etc.

The table represents an attempt to tabulate in each case, the compromise which seems the most acceptable to the individual. It has been made up by the author from more detailed expressions of the contributors' views, and the wording has not been submitted to the contributors for approval.

A number of "non-glare" headlight devices have been developed. The principles upon which these depend may be classified as follows:

- 1—By dimming the light.
- 2—By diffusing the light.
- 3—By cutting off the disturbing light.
- 4—By re-direction of the light.
- 5—By special type of reflector.
- 6—By change in the color of the light.
- 7—By tilting the reflector.

Several of the devices available make use of two or more of these principles.

### First Principle Is Simplest

The first and simplest principle is the mere dimming of the lights by means of a rheostat or by throwing the two incandescent lamps in series without changing the light distribution. As the beam candlepower is directly proportional to the brightness of the source, the reduction of the beam of this method of avoiding glare would be followed by a similar decrease of light upon the roadway.

### The Second Principle

The second principle, that of reducing the brightness of the beam by diffusion, is applied in the form of a diffusing front glass either clear or frosted. Any degree of diffusion required may thus be obtained. The diffusion has the effect of reducing the

beam intensity and contributing the light so gained to the illumination of objects contained within a much wider angle.

### Cutting Out Portions of Beam

The third principle, that of cutting out portions of the beam, depends on the fact that if the front end of the lamp filament is placed at the front of the reflector, the divergence of the beam reflected from the top of the reflector will all be above the horizontal, while that from the bottom will all be below the horizontal or axis of the reflector. Hence, if no reflected light from the upper half is allowed to emerge, all the light of the headlight will be along the axis and below it. This may be done by a blind over the top half of the glass front or by a cap over the top of the lamp bulb. This elimination of course reduces the beam candlepower and total flux to an extent which in many instances amounts to one half or more. A variation is made upon this method in some cases by frosting rather than rendering opaque the upper half of the reflector or lamp. Opaque caps covering the upper half

**Headlight Gleams**

*A balance should be secured between objectionable glare and useful driving light.*

*Non-glare devices operate on seven principles:*

- 1—By dimming the light
- 2—By diffusing the light
- 3—By cutting off the disturbing light
- 4—By re-direction of the light
- 5—By special type of reflector
- 6—By change in the color of the light
- 7—By tilting the reflector

*Non-glare devices classified:*

- 1—Control of light between source and reflector
- 2—Control of light by the reflector
- 3—Control of light after leaving reflector

*To conform with present laws headlight glass would have to be changed six times in driving 1000 miles.*

*Only enforcement of laws will bring non-glaring headlights.*

*Police dissatisfied with present constructions.*



of the lamp bulb, when black, will accomplish the same purpose as eliminating half of the reflector. If the opaque cap has a reflecting interior surface, the available flux impinging at the lower surface of the reflector is greatly increased, but the efficiency is still less than that of the same unit not so equipped.

Other Applications

The fourth principle, that of the reduction of light above the horizontal by re-direction is applied principally by the use of prismatic glass fronts which tend to re-direct all reflected light or by prisms surrounding the lower portion of the bulb.

The fifth principle involves the use of a split reflector hav-

ing its upper and lower halves of different focal length or having the foci separated by the filament length.

The sixth principle, that of reduction in apparent brightness and reduction in glare, by the change in color of light, is accomplished either by using a colored glass reflector or colored glass front and in some cases a colored glass bulb. It is asserted that a yellow beam of light will produce less glare and penetrate a fog better than the same intensity beam of unmodified light.

The seventh principle, that of tilting the headlights downward to the point where very little reflected light is above the horizontal, is a simple expedient and many cases would probably result in quite as effectual glare remedy as many other devices employed. This expedient is not looked upon

Table I.—Symposium of Illumination Requirements for Automobile Headlights

Questions	G. H. Stickney	Louis J. Stern	E. C. Patterson	F. H. Ford	Evan J. Edwards	Robert L. Sim	Dr. Louis Bell	Dr. H. P. Gage	A. L. McMurtry	Carl C. Linday	A. L. Powell	John E. Rayan	Dr. C. H. Sharp
1. Please indicate your ideal light distribution characteristic for automobile headlights with special reference to the following features:													
(a)—Angular distance of beam maximum below horizontal.....	1½ deg.	0 deg.	No beam	1-3 deg.	2 deg.	Horizontal or slightly below, falling off rapidly above and slowly below horizontal	Very slightly below horizontal	Very slightly below horizontal	0 deg.	No beam	1½ deg.	2 deg.	
(b)—Distance ahead of car at which center of beam should strike a level roadway.....	150 to 300 ft.	500 ft.	.....	600 ft.	100 to 200 ft. for good headlight, 50 ft. for poor	The further the better	Long driving light	Infinite distance	Infinite distance	.....	100 to 200 ft.	25 ft.	
(c)—Width of beam on level roadway at 50 ft.....	6 ft.	30 ft.	.....	.....	8 ft.	The broader the better	Sufficient direct light	10 ft.	No beam	.....	5 ft.	15 ft.	For country driving, narrow rows of beams which does not reach altitude sufficient to shine in the eyes of the opposing driver
Ditto at 100 ft.....	10 ft.	.....	.....	.....	14 ft.	.....	Cover roadway	15 ft.	Width of roadway	.....	10 ft.	30 ft.	
Ditto at 200 ft.....	12 ft.	.....	.....	20 ft.	20 ft.	.....	Cover roadway	25 ft.	Ability to discern objects on road	.....	20 ft.	60 ft.	
Ditto at 300 ft.....	16 ft.	.....	.....	.....	25 ft.	.....	Cover roadway	37½ ft.	Ditto	.....	.....	.....	
Ditto at 500 ft.....	20 ft.	.....	.....	.....	35 ft. Entire width at 25 ft.	.....	Cover roadway	62 ft.	Ditto	.....	.....	.....	
(d)—Proportion of reflected light which should be directed above the horizontal.....	Preferably not over 10 per cent	None	.....	None	As near as practicable	Of parallel rays, the less the better	None	Small amount	None	From 200 to 250 ft. to passing	None	One-third of the total light generated from either half of the reflector should be diffused	.....
2. Please state the distance at which the glare from most headlights is found to be most objectionable..	600 to 1,000 ft.	20 to 80 ft.	From their appearance to passing	0 to 400 ft.	200 ft. for unmodified parabola	100 to 200 ft.	Variable	100 to 200 ft.	200 ft. to passing	No—Eliminate beam	200 ft. to passing	100 ft.	Nearby
3. In your opinion is a height of 42 in. satisfactory as a limit below which the beam should be confined? If it is not satisfactory, do you consider any alternative?	Yes	Not entirely 48 in. better	No—Eliminate beam	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
4. Have you any practicable means to suggest for determining what is and what is not objectionable glare from automobile headlights?	That which obliterates adjacent objects	Indefinite. Should be based upon experiments	When subject cannot read fine print after being subjected to the light	No	Experimentation. 100 or more candle-power decided interference with vision	No	When surroundings of headlight can be seen unaccompanied by halo, glare is not objectionable	Above 1,000 beam candle-power	No	.....	Ability of driver to look at approaching car and clearly see objects between it and him	Ability to distinguish the light source at a distance of 50 to 75 ft.	No
Remarks.....	Conditions different for country and city driving. Background influence over glare	.....	Any light emitting rays or beam of light is objectionable, dangerous, and in many sections illegal	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

with favor by the law makers, in spite of the fact that a well-designed headlight pointed downward at an angle of 3 deg. the maximum would strike a level roadway 70 ft. in front of the car and the reflected light at the horizontal would be less than 40 per cent. of the beam intensity, while 1 deg. above for the reflected light would be about 15 per cent of the maximum. In many of the devices now in use the cut-off between the maximum and horizontal is not as good as the figures just shown.

**Devices for Reducing Glare**

It is interesting to note that in spite of the use of almost any device modifying the natural light distribution from an automobile headlight, an opposing driver will invariably allow his headlights to burn full intensity without modification unless one's own headlights are dimmed in passing.

The several devices available for reducing glare may be classified as follows:

- 1—Control of light between the source and reflector.
- 2—Control of light by the reflector.
- 3—Control of light after leaving the reflector.

The first class includes coloring, frosting or otherwise changing the surface of the bulb; and the use of caps and prisms.

The second class involves varying the contours and forms of the reflectors.

The third class involves the use of glass fronts made in the various forms and blinds. The various glass fronts used to control the reflected light may be divided into two classes, the prismatic and diffusing.

**Marks Conducts Discussion**

The discussion was conducted by L. B. Marks, past-president of the Illuminating Engineers' Society. He spoke of the importance of this problem since there is one automobile to every thirty-two people in the country and also because of the great variety of legislation. He stated that in order to conform with the law a man may have to change the headlight glass in his car six times in driving 1000 miles. He cited a few examples of legislation which showed the rather confused state of the legal side of the question.

Dr. Bell stated that the matter must be a compromise between cutting off light and eliminating glare. He said that as far as a simple glare eliminator is concerned, perfection is obtained by a simple disk of newspaper, the only trouble being that it also removes the illumination. It must be a compromise between extreme diffusion and extreme concentration of the reflected ray. Another point brought out by Dr. Bell is that in the cut-off type of headlamp glare reducer, the focusing of the light is of extreme importance.

A. L. McMurtry, who is a member of the standards com-

mittee of the S. A. E., said that a solution of the problem will never be reached until appearance and price cease to be the main requirements in headlight selection by the automobile manufacturer. Furthermore, he stated that there will be no change in the situation until the laws governing headlight glare are enforced. Regarding the confusion which exists on the subject he said that it is small wonder that this is the case if one stops to think that it is not surprising that a police officer shall not be able to define glare when the engineers have not been able to do so. He mentioned a device which had been brought out showing a rather humorous side of the situation, which when held in the hand of the operator indicated whether the light was glaring or not. He mentioned the fact also that it would not be advisable to give a preliminary report at this time on the activities of the S. A. E. standards committee.

**The Police Viewpoint**

Sergeant Richey of the New York police force, representing Deputy Commissioner L. S. Dunham, stated that the New York police force has an open mind on the glare subject but so far has not seen a single headlamp which was effective for country illumination that really complied with the law. The same fact is borne out by the opinion of the London police. He states that in many instances where he has been called upon to give decisions whether or not a headlight is glaring he has always decided against the headlight. He stated that the lamps giving the flat horizontal ray in which the height should not be more than 42 in. at 75 ft. are all right on flat roads, but on hills they are apt to be the contrary of correct. He also mentioned a variety of places where it would be impossible to see a pedestrian with the ordinary type of headlight and emphasized the importance of this by stating that there is one person killed on the streets of New York every 14 hr. and one injured every 23 min.

**Tail Lights Also Culpable**

Sergeant Richey also said that the commissioner had requested him to call the attention of manufacturers to the fact that the tail lights in most instances did not comply with the New York State law which said that they should render the numbers legible at a distance of 50 ft. in the direction that the vehicle is traveling.

James Hemstreet, representing the American Automobile Assn., spoke on the desire of the A. A. A. to protect the users of the highway, both pedestrians and occupants of vehicles, while the others went into the scientific side of the question from the standpoint of the suggestion of methods of diffusion of the rays so as to remove the objectionable glare while at the same time preserving the required amount of road illumination.

**Standing Records Recognized By A. A. A. Contest Board**

**DIVISION ONE**

**Competitive Records**

**SPEEDWAY RECORDS, CLASS "B" STOCK CHASSIS (Piston Displacement)**

**161 TO 230 CUBIC INCHES**

Miles	Time	H.M.S.	Driver	Car	Place	Date
4	3:49.00	...	Witt	E. M. F.	Atlanta	Nov. 3, 1910
5	4:35.47	...	L. Chevrolet	Buick	Indianapolis	July 2, 1910
10	8:55.40	...	L. Chevrolet	Buick	Indianapolis	July 2, 1910
20	19:51.00	...	Koipper	Chalmers	Atlanta	Nov. 12, 1909
50	50:36.00	...	Nelsoo	Buick	Atlanta	Nov. 9, 1909
100	1:40:46.81	...	Knipper	Chalmers	Atlanta	Nov. 10, 1909

**231 TO 300 CUBIC INCHES**

5	4:16.00	...	Dawson	Marmoo	Indianapolis	July 2, 1910
10	8:16.03	...	Harroun	Marmon	Indianapolis	May 27, 1910
20	17:10.70	...	Chevrolet	Buick	Atlanta	Nov. 11, 1909
25	21:48.92	...	Harroun	Marmon	Indianapolis	May 30, 1910

50	42:41.33	...	Harroun	Marmoo	Indianapolis	May 30, 1910
75	67:31.07	...	Harroun	Marmon	Atlanta	Nov. 11, 1909
100	1:30:08.31	...	Harroun	Marmon	Atlanta	Nov. 11, 1909

**301 TO 450 CUBIC INCHES**

5	4:05.76	...	Kiociad	National	Indianapolis	May 27, 1910
10	7:55.12	...	Aitken	National	Indianapolis	July 2, 1910
15	11:48.78	...	Aitken	National	Indianapolis	July 1, 1910
20	15:57.63	...	Dawson	Marmon	Indianapolis	May 27, 1910
50	39:47.35	...	Dawson	Marmoo	Atlanta	Nov. 3, 1910
75	1:00:16.34	...	Dawson	Marmoo	Indianapolis	May 27, 1910
100	1:23:43.11	...	Kiociad	National	Indianapolis	May 27, 1910
150	2:05:02.17	...	Chevrolet	Buick	Atlanta	Nov. 9, 1909
200	2:46:48.47	...	Chevrolet	Buick	Atlanta	Nov. 9, 1909
250	4:38:57.40	...	Burman	Buick	Indianapolis	Aug. 19, 1909

**451 TO 600 CUBIC INCHES**

5	4:01.36	...	Oldfield	Koox	Indianapolis	May 30, 1910
10	7:47.71	...	Robertson	Fiat	Atlanta	Nov. 11, 1909
20	15:57.41	...	De Palma	Fiat	Atlanta	May 5, 1910
50	42:02.98	...	Robertson	Fiat	Atlanta	Nov. 13, 1909
1.3	1:22:35.35	...	Robertson	Fiat	Atlanta	Nov. 13, 1909
150	2:03:09.63	...	Robertson	Fiat	Atlanta	Nov. 13, 1909
200	2:53:48.32	...	Disbrow	Rainier	Atlanta	Nov. 13, 1909

SPEEDWAY RECORDS, CLASS "C" NON-STOCK (Piston Displacement)

Table with columns for distance, time, driver, car, place, and date. Sub-sections: 161 TO 230 CUBIC INCHES, 231 TO 300 CUBIC INCHES, 301 TO 450 CUBIC INCHES.

STRAIGHTWAY RECORDS, REGARDLESS OF CLASS, NON-STOCK

Table with columns for distance, time, driver, car, place, and date. Sub-section: (Standing Start).

Hour Records

SPEEDWAY, CLASS "B" STOCK CHASSIS (Piston Displacement)

Table with columns for distance, time, driver, car, place, and date. Sub-section: 231 TO 300 CUBIC INCHES.

SPEEDWAY RECORDS REGARDLESS OF CLASS, NON-STOCK

Table with columns for distance, time, driver, car, place, and date.

DIVISION TWO Non-Competitive Records

SPEEDWAY RECORDS, CLASS "B" STOCK CAR (Piston Displacement)

Table with columns for distance, time, driver, car, place, and date. Sub-section: 231 TO 300 CUBIC INCHES.

SPEEDWAY RECORDS, CLASS "B" STOCK CHASSIS (Piston Displacement)

Table with columns for distance, time, driver, car, place, and date. Sub-section: 160 CUBIC INCHES AND UNDER.

SPEEDWAY RECORDS, CLASS "C" NON-STOCK (Piston Displacement)

Table with columns for distance, time, driver, car, place, and date. Sub-section: 160 CUBIC INCHES AND UNDER.

SPEEDWAY RECORDS, REGARDLESS OF CLASS, NON-STOCK

Table with columns for distance, time, driver, car, place, and date.

ONE MILE CIRCULAR DIRT TRACK RECORDS, NON-STOCK

Table with columns for distance, time, driver, car, place, and date.

STRAIGHTWAY RECORDS, CLASS "B" STOCK CHASSIS (Piston Displacement)

Table with columns for distance, time, driver, car, place, and date. Sub-sections: 231 TO 300 CUBIC INCHES, 301 TO 450 CUBIC INCHES.

ONE MILE CIRCULAR DIRT TRACK RECORDS—NON-STOCK

Table with columns for distance, time, driver, car, place, and date.

STRAIGHTWAY RECORDS, CLASS "B" STOCK CHASSIS (Piston Displacement)

Table with columns for distance, time, driver, car, place, and date. Sub-sections: 161 TO 230 CUBIC INCHES, 231 TO 300 CUBIC INCHES, 301 TO 450 CUBIC INCHES.

STRAIGHTWAY RECORDS, REGARDLESS OF CLASS—NON-STOCK

Table with columns for distance, time, driver, car, place, and date.

Hour Records

SPEEDWAY, REGARDLESS OF CLASS, NON-STOCK

Table with columns for distance, time, driver, car, place, and date.

ONE MILE CIRCULAR DIRT TRACK, REGARDLESS OF CLASS, STOCK CHASSIS

Table with columns for distance, time, driver, car, place, and date.

ONE MILE CIRCULAR DIRT TRACK, REGARDLESS OF CLASS, NON-STOCK

Table with columns for distance, time, driver, car, place, and date.

STRAIGHTWAY, REGARDLESS OF CLASS, NON-STOCK

Table with columns for distance, time, driver, car, place, and date.

# Zeppelin Power Plant Engineering

## Part I

### An Exhaustive Study of the Details of German Aircraft Engine Construction as Embodied in Zeppelins Recently Brought Down in England

¶ EDITOR'S NOTE—Special facilities for the examination of these engines have been offered engineers by the English government in the hope that the science of aviation engine construction will be broadly benefited thereby.

OUR British contemporary, *The Automobile Engineer*, announced in its December issue that it will publish a series of articles giving the detail of the engines of some of the Zeppelin airships which have fallen into English hands. Special facilities have apparently been offered by the government for the examination of these engines, and the idea presumably is that all aviation engine builders will find something helpful in this close study of the latest German designs.

Since this is at least as interesting to American constructors as to any others, we propose to reprint these articles almost in full; the first of the series following hereunder:

Our first, and present, description is of the Maybach engine, as fitted to the Schutte Lantz and Zeppelin airships. This engine is probably of the latest Maybach design, and presents many interesting features, although main interest really centers around the parts that are more in the nature of accessory fittings, made necessary or advisable by the particular application of the engine, viz., airship propulsion. Before proceeding to describe the engine and its accessories in detail, a general outline of the function and layout of the more unusual fittings will doubtless be of interest.

Instead of regarding each portion of the engine accessory system as a separate item, it will probably be simpler to regard each fitting as a separate item in reviewing its purpose in the general layout, and also to confine our attention at the moment to those parts not usually found on an aircraft engine.

#### Oil Supply Controls Fuel

Referring to the general diagram of the oil and fuel pressure system, Fig. 1, it will be seen that in the top left-hand corner there are two pumps driven by a common crank that is attached to a shaft, this shaft being worm gear driven off the engine crankshaft. The horizontal pump is that for the fuel, and it will be noticed that the valves of this pump are far removed from the pump itself, being located at the base of the chamber seen at the bottom left-hand corner of the general diagram. The reason for this arrangement is the practical impossibility of pumping liquid gasoline, so that a column of air has been interposed between the pump and the fuel itself. It will be noticed that the fitting containing the fuel pump valves also carries the oil filter, of course, definitely divided off, but incorporated in the body of the same fitting. The reason for this is most probably that it happened to be convenient to embody the two in one. There does not seem to be very much reason to suppose that the two are combined with a view to warming the fuel and alternatively cooling the oil. Its position on the engine is denoted by the letter A in the general arrangement diagram of the engine, Fig. 2.

The fitting shown at the right-hand bottom corner of

Fig. 1 is really merely the float chamber to the carbureter. It functions somewhat differently, as it is arranged to operate at varying altitudes, but in effect it serves the purpose of a float chamber to feed the carbureter reservoir. Its position relative to the engine is shown at B in Fig. 2, and it has probably been located in the position shown from motives of safety, as evidently, in the position shown in the general diagram, danger arising from a float chamber near to the engine is avoided.

With reference to the oil system, this is made clear in a detailed description following, and calls for no special note at this point, except as regards the control that the oil pressure exercises over the fuel supply. This control is clearly shown to the right in the diagram, Fig. 1, where connection will be seen between the jet damper and an oil controlled vertical piston. This piston is under oil pressure, and serves merely to hold out of action a stop that controls the jet cut-off, so that as long as the oil pressure maintains the fuel supply continues. When the oil pressure drops below a predetermined limit, the piston rises under the influence of its spring, releasing a catch and so closing the jet. Oil to this fuel controlling piston is distributed through a centrifugally-governed piston valve that is adjustable externally, the oil being throttled by means of an adjusting

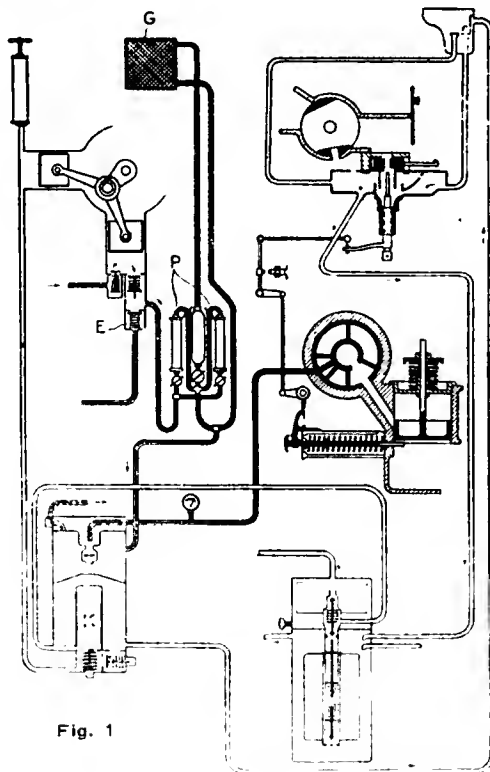


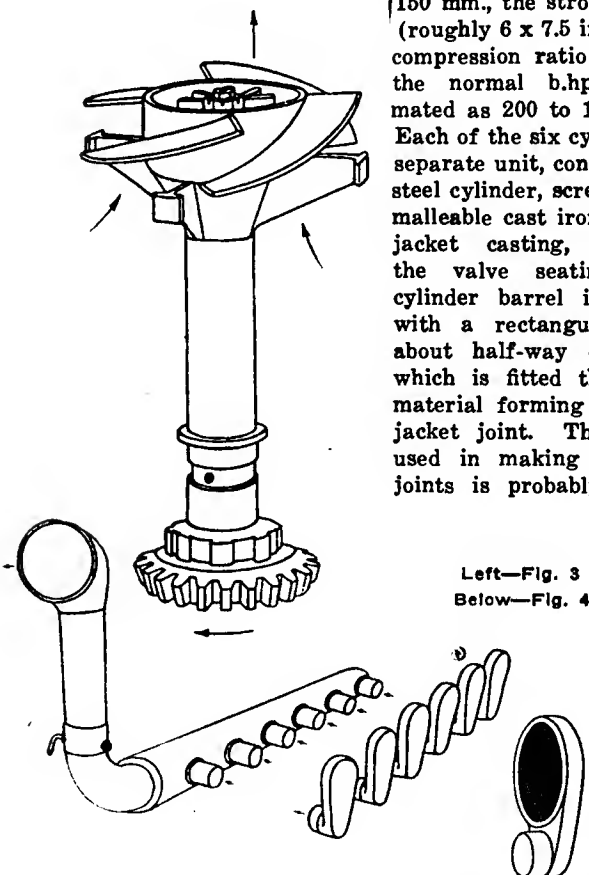
Fig. 1

lever that limits the travel of the piston valve, so that by the setting of the lever, the actual oil pressure in the lubricating system is determined. This explanation does not quite coincide with the positions assigned to the oil piston valves and ports in another diagram, but the present diagram, Fig. 1, gives a satisfactory explanation of the principle of the control. Evidently the piston controlling the fuel cut-out stop can, by so arranging the strength of its spring, be given a certain range of action; that is to say, it can be designed to maintain its position and hold off the fuel stop between any range of oil pressure required, say, from 5 lb. minimum to 35 lb. maximum, according to the strength of the spring, which merely needs to be strong enough to overcome the minimum pressure decided upon, as it is not until oil pressure drops that there is any necessity for cutting off the fuel.

The carbureter, which is shown in the top right-hand corner of the diagram, Fig. 1, needs no general explanation at this stage, and will be described in full detail later. The small oil radiator, together with the system of filters beneath it, are simply the oil cooling and filtering circuit, and, as a matter of fact, it is believed that these were, by a curious whim of the chief engineer, generally cut right out of service when the airships were in use.

The engine starting mechanism consisted of a pump and the necessary mechanism for filling the cylinders with mixture, which was ignited by a geared-up hand starter. Fuller details of this system are given in the following pages.

With regard to details of the engine itself, the bore is 150 mm., the stroke 190 mm. (roughly 6 x 7.5 in.), and the compression ratio 5.94 to 1; the normal b.h.p. is estimated as 200 to 1,200 r.p.m. Each of the six cylinders is a separate unit, consisting of a steel cylinder, screwed into a malleable cast iron head and jacket casting, containing the valve seatings. The cylinder barrel is provided with a rectangular groove about half-way down, into which is fitted the packing material forming the water-jacket joint. The material used in making the water joints is probably asbestos,



Left—Fig. 3  
Below—Fig. 4

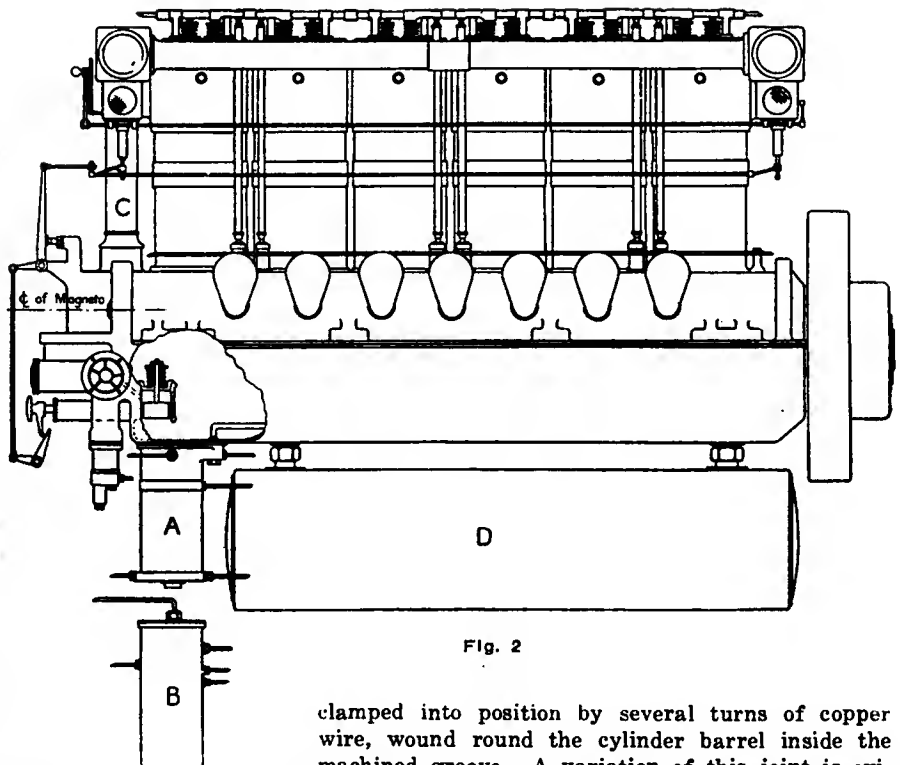


Fig. 2

clamped into position by several turns of copper wire, wound round the cylinder barrel inside the machined groove. A variation of this joint is evidently in use, as on a cylinder carried on the Zeppelin as a spare a large union nut was employed at the flange, and a plain joint used in the cylinder head. The cylinder barrel is hardened at its base, or holding-down flange for strength.

#### Five Valves Per Cylinder

Five valves per cylinder are arranged, the two inlet ports being 48 mm. diameter and the exhaust ports 35 mm. diameter. The exhaust valves are situated on the left-hand side of the engine looking from the flywheel and propeller end, and all the valves are of the overhead type, working vertically in the water-cooled cylinder head, and operated by rocker arms. All the three valve rocker arms for the exhaust valves are in one stamping, and are operated by one push rod. Similar construction and actuation are adopted for the inlets, the push rod ends being cupped, and the rockers and tappets arranged with spherical heads to correspond. The rocker arms are on hollow spindles supported on brackets bolted to the cylinder heads. No adjustment is provided other than the adjusting screw on each valve rocker arm.

#### Simple Water Joint

The valve gear is operated by two camshafts, one on either side of the crankshaft. These are driven by gears inside the crankcase at the flywheel end. Cam rollers are fitted to the tappets in the usual manner.

The large circular water joint between each of the six cylinders is made by a 6½-in. diameter rubber and wire ring about ½ in. thick, encircled by a band clip of sheet brass. This clip, when screwed up, reduces the diameter of the packing ring, causing the rubber to expand, thus making a simple face joint against the two machined faces of the water jackets. Water cooling is by a pump working vertically inside the water lead to the front cylinder in an extension of the crankcase casting. The pump spindle with vane shown in Fig. 3 is driven directly off the crankshaft bevel gear at twice the speed of the engine; its position is shown at C in Fig. 2.

The diameter of the water inlet pipe leading from the radiator to the crankcase extension is 2¼ in. Water from the pump enters the aluminum water jacket surrounding the

front carbureter, which is attached to the 6½-in. water joint flange of the front cylinder, and thence the water flows through all the cylinder jackets and, circling the water jacket of the other carbureter attached to the flange of the rear cylinder, enters the copper water jacket surrounding the exhaust manifold, whence a return pipe leads back to the radiator. The crankcase is internally scavenged and cooled by inducing a current of air, as shown in Fig. 4. A marine-type cowl that projects through the roof of the gondola leads direct to a large aluminum pipe, tapering in diameter, arranged externally beside the crankcase and communicating with it by six short branches.

Attached to the crankcase in a similar position on the opposite side are six breathers, or gauze-covered ventilators, that stand vertically and flat against the crankcase. The arrangement of this breathing or scavenging is as shown in Fig. 4, but it should be noted that the cowl opening is toward the rear of the ship, so that scavenging takes place by suction induced by the ship's motion.

The cylinder holding-down bolts are pegged into the crankcase casting at the top, and are provided with flanges, so that the bearing caps are not disturbed when the cylinders are removed, as the holding-down bolts pass right through the crankcase top half in the usual manner. Each cylinder is held down by four clamps or dogs.

With regard to lubrication, oil is drawn by the vertical oil pump, Figs. 1 and 5, from the oil service tank D, Fig. 2. situated below the crank chamber, through the check valves directly below the pump piston by a pipe leading to the two vertical filters P, whence the oil is led into the top of the small oil cooler or radiator G, Fig. 1. This cooler is situated outside the gondola.

After passing through the cooler, the oil returns through the main oil filter K to the main bearings. The main bearings can also be lubricated direct from the pressure pump, cutting out the oil-cooking system by the cocks below the

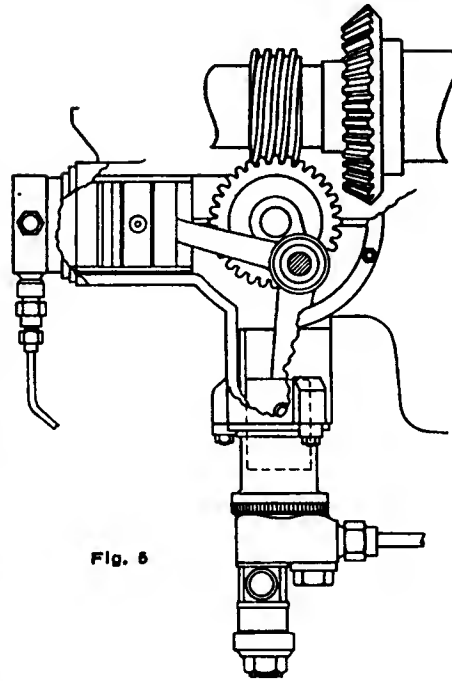


Fig. 5

troughs clamped together by a 7 mm. bolt through the hollow crank pin. The weight of the complete crankshaft with camshaft driving pinion and bevel gear for driving the water pump, etc., is about 99 lb.

The pistons are of cast iron, fitted with three rings above the wrist pin, each piston weighing, complete with pin and rings, 10.84 lb. The pin is 38 mm. diameter, and is located by a set screw, screwed vertically into the pin from the bottom of the pin boss inside the piston and locked with a cotter pin inside the hollow wrist pin.

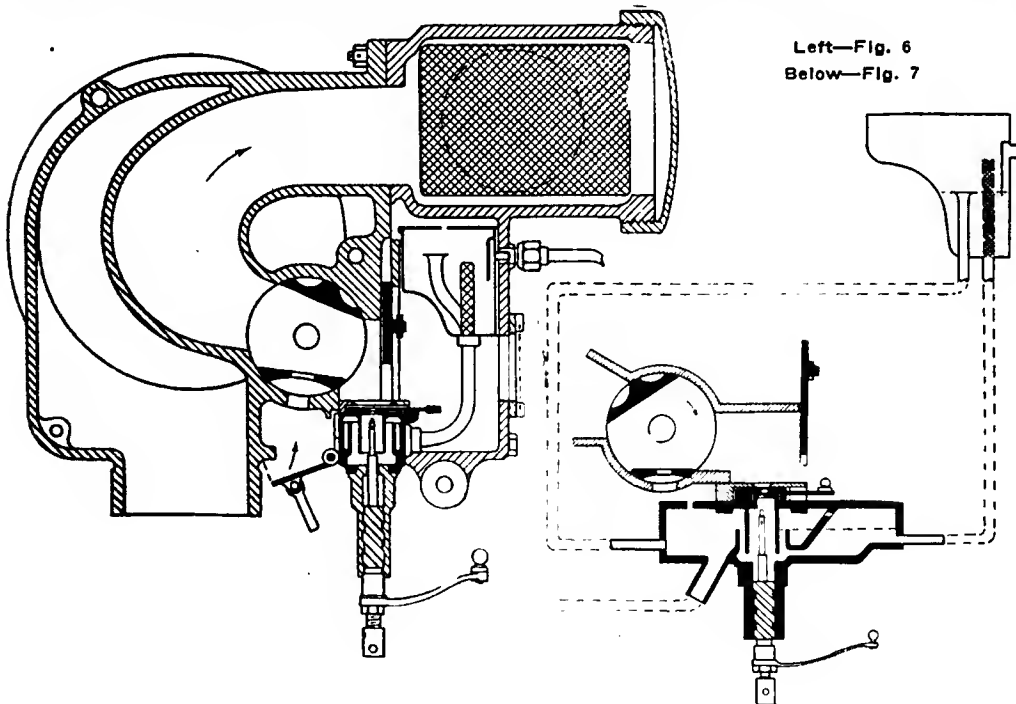
The connecting rods are square section externally, 33 mm. each way, and are bored up the center with a 26-mm. hole, through the center of which an 11-mm. pipe is fixed, leading from the big end bearing to the piston pin bush for lubricating the small end.

Each engine is fitted with two separate carbureters, situated at either end of the engine itself. They are attached to the water jackets of the end cylinders by the water jacket flanges. A sketch arrangement of the carbureters showing the position of the jet, throttle valve, and constant head jet reservoir, and also the water jackets, is shown in Fig. 6.

The large cylindrical wire gauze baffle adjacent to the carbureter, and at the end of the induction pipe shown in the sketch, is presumably to stop firing back into the carbureter. It might also further break up the mixture.

A detailed account of the working of the carbureter, with its unusual system of fuel supply, will doubtless be of interest, and in Fig. 7 is given a diagram of the carbureter, that has been prepared to show the observed interior construction. The carbureter consists of the following parts: A barrel throttle, a main air regulator, a jet, and damping device, and a constant head gravity fuel feed reservoir.

The rotary barrel throttle



Left—Fig. 6  
Below—Fig. 7

opens on one side to the inlet pipe, on the other to a mixing chamber. In the lower portion of the barrel is a large extra air port registering with a port in the casing. The size of this port is further controlled by an air shutter (not shown).

The main air regulator is of the sliding shutter or guillotine type. It opens or shuts as the throttle opens or shuts, being interconnected by bell crank levers.

**Variable Jet**

The jet has an eccentric hole covered by a cap also with an eccentric hole, so that rotation of the cap regulates the area of the jet hole. The arrangement appears similar in action to the jet of the White and Poppe carbureter. The jet cap is also interconnected with the throttle and air slide, opening when they open, and vice versa.

The jet damping device is interconnected with the lubrication system, but might have been operated separately, if desired.

The constant head gravity petrol feed to the jet, in lieu of the usual and adjacent float feed, is provided by a small reservoir placed a little higher than the jet, that is fed from the float chamber, in turn fed from the pump and the separate air vessel or valve box.

It may be safely assumed that the operation of the carbureter, so far as carburetion is concerned, is the same as in the White and Poppe; that is to say, the quality of the mixture is, at any throttle opening, kept constant by mechanical means, i.e., the interconnection of the throttle air and jet orifices, as shown in Fig. 9. Means of adjustment of the relative setting of these three are provided.

**Peculiar Fuel Feed**

The method of obtaining a constant feed to the jet without the usual float chamber is as follows: Fuel is fed into the upper reservoir seen on the right-hand side at the top of Fig. 7. From this reservoir it flows via the gauze filter-ended feed pipe downward to the jet container, which, it will be noticed, is divided into two compartments by an inclined wall having a passage at its base leading into a short, wide "sealing" chamber or tube that is open at the top. At the top of the inclined wall is an air vent leading into the second compartment, and to the left in the top wall of the latter is another vent leading to the outer atmosphere. (It should be noted that this air vent does not in the actual construction come near the air intake port in the side of the throttle, and is only shown in that position owing to the

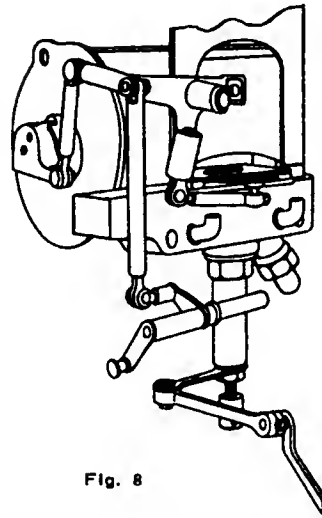


Fig. 8

exigencies of diagram making.) The hole forming the jet proper is drilled through the top face of a short cylindrical boss projecting up from the cover of the jet container. The exterior of this boss forms the bearing upon which the eccentric jet cap rotates. Downward from the cover, and surrounding the jet boss, there depends a tube open at the lower end and reaching almost to the bottom of the "sealing" tube referred to above. Gasoline, then under the influence of gravity, flows from the upper reservoir into the first compartment and thence into the "sealing" tube, from which the jet draws as much as required; any surplus flow rises over the edge of the "sealing" tube and runs away into the overflow pipe at the base of the second chamber seen to the left in the diagram. As the upper reservoir tank and the "sealing" tube are both open to atmospheric pressure,

the feed of gasoline to the jet is unaffected by variation in altitude; that is to say, the level in the jet remains constant during any change in atmospheric pressure, as is not the case with the ordinary float feed. If more fuel than required is fed into the upper reservoir it is carried away by the overflow pipe therein down into the second chamber, and thence, together with the surplus from the "sealing" tube, away to the fuel supply regulator, or float chamber, shown in Fig. 9.

**Three Units in Fuel System**

In the fuel feeding system to the carbureters there are three units—a pressure pump, a valve box, and a float chamber or fuel regulator. The relative connection of these can be seen in the arrangement diagram, Fig. 1.

Figs. 5 and 10 show the fuel pump system. An extension of the shaft driving the governor carries a small crank pin from which two connecting rods proceed to two pistons and pump cylinders set at right angles.

**Three Connections**

The horizontal or fuel pump has three connections, viz., a small bore pipe connected to an auxiliary hand pressure pump, and a pipe to dial gauges carried on the side of the crankcase, while the other connection proceeds to the cylindrical fitting containing the valves for the pump. This fitting is bolted to the bottom of the crankcase, as indicated at A in the general lay-out diagram, Fig. 2, and is shown in detail in Fig. 11.

(To be continued)

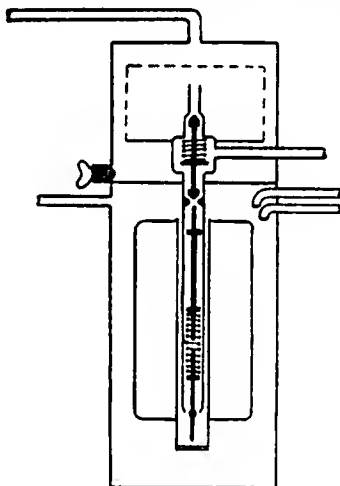


Fig. 9

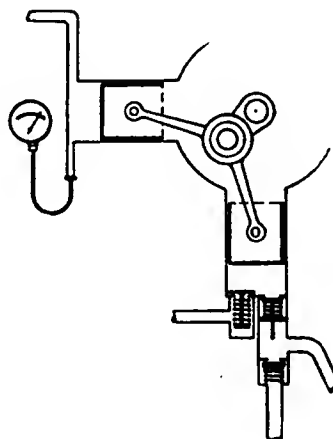


Fig. 10

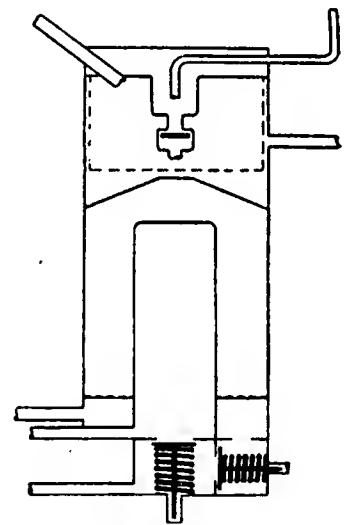


Fig. 11

# Car Makers' Conference on World's Export Trade

More Than Forty Export Managers Meet Under Auspices of N.A.C.C. in U.S.A.'s First Automobile Export Conference—Requirements for S. A., China and Other Fields

**N**EW YORK CITY, Jan. 12—More than forty export managers of automobile manufacturing concerns, members of the National Automobile Chamber of Commerce, Inc., met to-day in an export conference, the first of its kind ever held in this country. The conference, held under the direct supervision of the N.A.C.C., was brimful of practical export ideas and the nine papers presented and the discussion which followed demonstrated that the co-operation which has been characteristic of this chamber in its matters relating to domestic affairs will be extended to its export field. The conference was featured by a general spirit of co-operation. One export manager told his troubles to the others; there was a general laying of the cards on the table; there was a general calling a spade a spade; and in short many resolutions were drafted to the N.A.C.C. which should result in improving export trade.

One of the main subjects was whether U. S. A. makers should build special cars for export trade or whether they should sell foreign countries the U. S. A. standardized car. E. W. Davenport, export manager of the Maxwell Motor Co., prepared a paper which took the stand that U. S. A. makers have been able to produce a low-priced car of high quality because of manufacturing but one model. If it were necessary to build another model for export or to modify the existing one, that would add to the expense and make it necessary to sell at a higher figure, thereby, to an extent, sacrificing part of the great advantage gained in production.

Discussions are always the most valuable parts of such papers and this subject was plainly discussed by over a dozen export managers. The final consensus of opinion was that a committee should be appointed to draft resolutions to the N.A.C.C. Irrespective of what this committee may report, sentiment among the exporters favored the idea of selling the U. S. A. car which lists at less than \$1,000 in the U. S. A. in essentially its present form to foreign countries. There is practically no foreign competition for a car of this price and consequently little necessity for remaking it for export trade, particularly when remaking it means higher prices.

On the other hand, those American cars selling between \$1,500 and \$3,000, which have foreign competition in their fields, will have to be modified as necessary to meet trade conditions. Color options and other options are liberally given in the home market and they will have to be extended to the foreign dealer. In this connection many makers feel they

should give 60-in. tread, as German, Italian, French and English makers are offering such inducements. Right-hand steering must be given in both classes and the majority of manufacturers are agreed on this. The question of necessary clearance is also a debatable one.

U. S. A. manufacturers have generally agreed to discontinue the manufacture of 60-in. tread for export work, this action dating as of Jan. 1, 1917. To overcome any handicap placed on our manufacturers by this section it was agreed that an educational movement for road improvement in foreign countries should be favored and that manufacturers and associations should lend their support to such a movement. The foreign dealer could be shown what has been done in the U. S. A. by way of road improvement in such states as Iowa, Nebraska, Kansas, Missouri, etc., where dirt roads are dragged and otherwise treated.

The value of China as a foreign market was analyzed by Charles Denby, export manager of the Hupp Motor Car Co., who has spent many years in that country. With its 450,000,000 population, Mr. Denby considered China one of the greatest future fields for the automobile. Before the automobile will take hold it will be essential to build roads, which should be encouraged by the American industry. Mr. Denby strongly advocated members of American firms personally visiting China and investigating the field.

On the subject of the South American market, David Beecroft, directing editor of THE AUTOMOBILE, made several recommendations as to the best method of capturing the South American trade. Argentina, one of the greatest South American fields, is badly in need of roads, and to stimulate this movement the U. S. A. manufacturers should institute a road improvement propaganda for that country. With the large landowners such a movement could be readily fostered.

## Need Electrical Equipment Service

A second essential in the South American field, according to Mr. Beecroft, is the necessity of having influential members of our different companies visit and become acquainted with the South American field. Our makers have relied too much on so-called export men who are not close enough to our automobile industry. What South America needs is a closer personal relationship between its dealers and our manufacturers. With such a relationship many of the existing export troubles will vanish.

A better service covering the electrical equipment of

## Export Conference Opinions

- Sell cars under \$1,000 unchanged abroad.
- Modify more expensive types as necessary.
- Discontinue exportation of 60-in. tread cars.
- Encourage good roads movements abroad.
- Study foreign markets more thoroughly.
- Co-operate with other U. S. A. manufacturers.
- Improve service available for foreign users.
- Send shipments forward regularly.
- Elevate grade of catalogs for export.
- Check crating closely to cut shipping expense.



U. S. A. cars is needed in the Argentine field. Electric starting, lighting and battery ignition are entirely local to U. S. A. so far as invention and manufacture are concerned. Because of this U. S. A. makers should furnish expert service assistance for educating the dealers in the South American field. Mr. Beecroft recommended co-operation among six or eight makers on this electrical service and suggested one service expert man for Argentina and another for Brazil.

In several foreign countries, and also in the Philippine Islands, there has been much opposition to battery ignition and U. S. A. makers have had to equip their cars with magnetos for such trade. Investigations have revealed the fact that the opposition to battery system has largely been one of ignorance which could to an extent be overcome by such an educational service plan.

#### Spare Parts Essential

For the South American trade it is essential to have an adequate supply of spare parts at such centers as Buenos Aires and Rio de Janeiro. No U. S. A. manufacturer should go into the South American field without being pledged to carry a large supply of spares. This has been a serious handicap to our foreign trade, not only in South America but in Denmark, Scandinavia, British South Africa, parts of Australia and other British possessions.

A further essential for foreign trade in South America as well as any other country, is that the U. S. A. maker must allot a certain percentage of his output for foreign dealers, and their shipments must go forward as regularly as home shipments. A foreign dealer cannot be expected to pay rent for a salesroom, maintain a sales force, carry on advertising campaigns, and undertake other expenses in connection with selling a product, and then not be given cars at the season he requires them.

#### Export Catalog Requirements

The subject of catalogs in foreign languages, as well as instruction books, etc., was discussed by F. B. Amos, foreign advertising manager of the Studebaker Corp. of America. Mr. Amos analyzed the difficulty of getting the correct translations for catalogs, advertisements, etc., and suggested the necessity of not only securing the best translators but paying them a fair price. There is too much effort after cheap translations. Cheap translations generally are a boomerang. Wrong words are used and entirely wrong conceptions given. It is often necessary to have two or three different men check a translation. Literature for foreign countries must be well illustrated, particularly for Latin countries. The text must be short and direct but not so concise as for U. S. A. literature. Bombastic statements must be avoided as they may serve for local use, but are not in good order in foreign countries where they are misinterpreted. Mr. Amos suggested that advertisements for foreign countries should not be written at the U. S. A. factory. This work should largely be left in the hands of the foreign dealer. He strongly recommended instruction books in different foreign languages and that these should go forward with the first shipment of cars, a practice followed by France and Germany.

#### Must Check Crating Closely

The various ins and outs of crating cars for export, shipping, etc., was handled by M. J. Budlong, of Gaston, Williams & Wigmore, exporting organization of New York City. Mr. Budlong's paper told the necessity of closely checking the crating of cars for export. On one shipment of fifty cars the crates were made 1 in. too high, which increased the shipping cost \$300 on the lot. The carpenters in charge had explicit instructions as to size, but close checking was necessary while the work was going on. If this crating is not

closely watched many thousands of dollars will be foolishly expended each year in this way. The paper also referred to the difficulty of not properly addressing crates for the foreign trade and cited as an example one shipment of 250 crates which was to be shipped from the port of New York on a certain steamer. The crates arrived by railroad the afternoon before shipment at which time it was discovered they were not correctly addressed. The work of re-addressing was commenced, but was not completed in time, and the shipping space was taken by another shipper. The net result was delayed shipments with consequent troubles. Conditions of this nature are constantly coming up in the export field.

Alfred Reeves, general manager of the association, presided, and in attendance were the following:

A. S. Watson (Allen); Geo. H. Strout, export manager (Apperson); J. I. Farley, second vice-president (Auburn); A. M. Bates (Autocar); F. C. Irons, export manager (Bartholomew); W. D. Loomis, manager freight department (Cadillac); L. E. Blocker, foreign department (Chalmers); W. S. M. Mead, vice-president (Chandler); Arthur Hurtig, manager export division (Chevrolet); Pablo Homs, export manager (Cole); J. W. Fulreader, treasurer, C. A. Baird, sales manager (Cunningham); Xavier Ch. De Nice, export manager (Davis); G. W. Werden, export manager, C. T. Chenevert, traveling representative, Beckwith Havens, traveling representative (Denby); H. M. Robins, foreign sales manager (Dodge); John Reid, export department (Dort); G. B. Pratt, secretary, C. R. Bissell, export agent (Elkhart); Tom O. Jones, export manager (Empire); R. N. Lockwood (Federal); S. E. Ackerman, assistant to president (Franklin); P. S. Steenstrup, vice-president, J. A. Olt, assistant manager, G. W. Hawkins, assistant treasurer (General Motors Export); G. T. Stannard, C. B. Warren, manager New York branch, G. F. W. Poggenberg, manager export department, W. L. Day, general manager (General Motors Truck); E. T. Sayers (Garford); C. H. Meeker, manager agency department (General Vehicle); H. B. Phipps, export manager (Hudson); Charles Denby, export manager (Hupp); T. J. Turk, assistant general manager, B. W. Twyman, general manager, J. B. Crockett, manager export department, Amos White, assistant export manager, E. B. Proudfoot, manager traffic department, A. Vaccola (Inter-State); H. H. Robinson, assistant to president (Kelly-Springfield); W. R. Vogeler, export manager (King); J. A. Kline, general manager (Kline); F. T. Newton, sales manager (Lewis Spring & Axle); Emery Huston, advertising and assistant sales manager (Lexington-Howard); E. A. Travis, general sales manager (Locomobile); L. B. Berger, assistant treasurer (Lozier); A. H. McFarlan, president (McFarlan); G. H. Hodges, assistant general sales agent, W. T. Stevens, manager for export (Mack); C. O. Assmus, export sales manager (Maxwell); F. H. Dodge, treasurer, Otto Marx, vice-president (Milburn); C. H. VanDervoort, sales manager, D. M. Beal (Moline); J. I. Handley, president, A. Moorhouse (Mutual); John A. Rose, export sales manager (Nash); A. E. Vinton, export manager (National); H. H. Brand, treasurer (Ohio Electric); R. F. Gifford, foreign manager (Paige-Detroit); W. S. Paterson, secretary (Paterson); R. C. Getsinger, sales manager, C. F. Carew (Saxon); H. T. Holder, export manager (Scripps-Booth); R. H. Salmons, vice-president, W. F. Reynolds, export manager (Selden); H. A. Houser, assistant manager automobile department (Standard Steel Car); W. P. Held, New York branch manager (Sterling); J. P. Roberts, F. B. Amos, foreign advertising manager, F. R. Lackey traffic department (Studebaker); R. T. Yeats, director of exports (United Detroit); Maurice Walter, president (Walter); H. G. Root, general manager (Westcott); Jay Rathbun, manager foreign department (White); R. J. Archer, export department (Willys-Overland); O. F. Baughman, sales manager (Winton); Thos. Clements, vice-president (Woods).

# Unique Fageol Truck Spring Lubrication

### New 2-Ton Design Has Oil Reservoirs Supplying Every Shackle Bolt— Dog Clutch Type Transmission

**T**HE outstanding feature of the Fageol truck, to be made by the Fageol Motor Co., Oakland, Cal., is the unique system of spring lubrication, details of which are shown in the accompanying illustration. The upper view shows the support for the rear end of the front spring. The frame bracket is hollow and can be filled with oil, a wick leading from the reservoir to the center of the upper shackle bolt. This is drilled out and bored with a cross hole, allowing the oil to pass to the left-hand end, thence it goes down through a hole in the side of the shackle to the lower bolt which is also drilled to carry the lubricant to the middle of the bushings.

#### Ample Spring Suspension Oiling

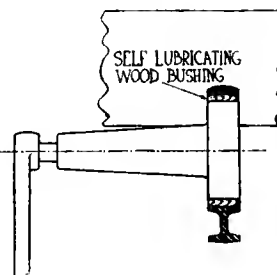
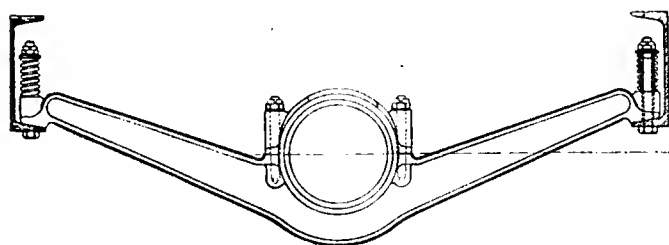
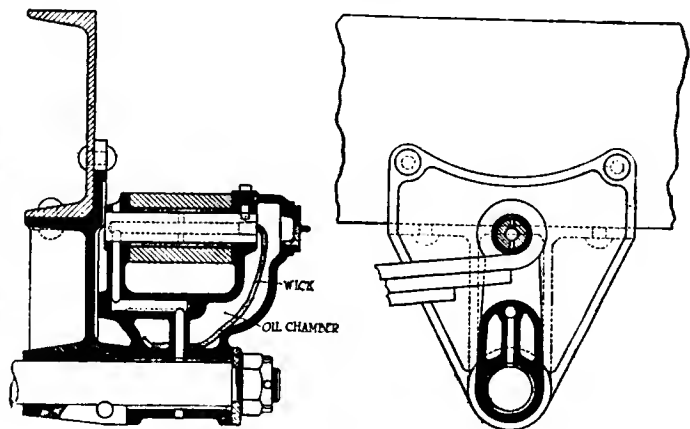
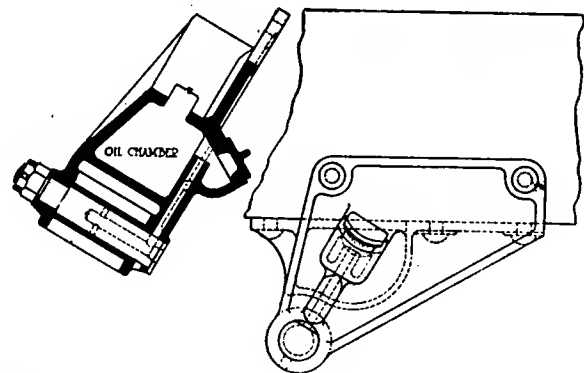
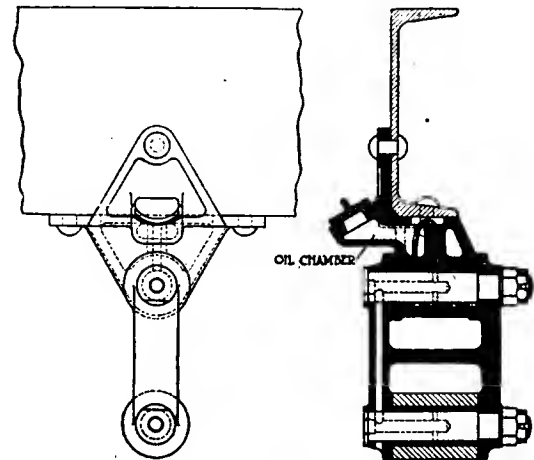
The lower view shows the suspension for the front end of the rear springs, the section being a projection on the center line of the filler cap. It will be noticed that the oil capacity here is very large indeed. At the bottom is the rear end hanger for the rear spring, in which the wick lifts the oil from the reservoir to the upper bolt.

There have been many attempts to obtain automatic lubrication of this nature, but the Fageol design certainly appears to be in advance of anything of the kind previously on record. Proper spring shackle lubrication is enormously important, especially on a truck, and spring bolt wear is one of the most troublesome things in truck service. Thus the evidently costly construction of the Fageol is without doubt worth while. It is not stated how often oil has to be replenished in the reservoirs, but this operation would certainly not have to be performed except at fairly long intervals. Something of this sort has, eventually, got to be provided for all vehicles, passenger cars and trucks alike, so the illustrations are worthy of study by all engineers.

#### Fixed Spark Magneto Used

A Waukesha engine is used with a stroke of 5 3/4, and the bore will be either 3 3/4 or 4 1/4. The transmission includes a gearbox which has constant mesh gears selected with dog clutch engagement and the main clutch is a Borg & Beck three-plate. The final drive is by overhead worm and the propeller shaft is divided, there being four universal joints and the center bearing attached to a cross member of the frame.

Hotchkiss drive is used and both brakes are internal on the rear axle. A rather unusual engine feature is the employment of a fixed spark magneto, the carbureter being a Zenith. The wheelbase is 144 in. and the tires 34 by 4 front and 36 by 6 rear.



Above—Details of oil-containing spring shackles and hangers used on Fageol truck

Left—Beam supporting front end of power plant. Note the wood bushing used

# The Ultimate Tractor Engine

90 Per Cent of All Farms Require Four-Cylinder Engine of 16 to 40 Hp. Operating on Four Stroke Cycle—A Formula for Calculating Most Satisfactory Operating Speed

By H. L. Horning

General Manager Waukesha Motor Co.

IT would be presumptuous for any man to attempt to prophesy the type of tractor engine, if any, which will ultimately survive, particularly since the tractor industry is the youngest of all hopeful industries. So incomplete is the science of tractor farming, so limited is the development of the art that any man entitled to be called a tractor engineer can be called a pioneer.

Tractors have passed through three distinct phases of development up to this time: First, steam threshing engines; these hardly could propel themselves owing to the excessive weight per horsepower developed and could haul only the water and coal needed for a journey of a few miles. A large number of these are being used for threshing service. Second, steam tractors for threshing and plowing; these were much lighter per horsepower developed and could travel a longer distance on the fuel and water that they could carry. Third, the tractor equipped with internal-combustion engines, which is developing rapidly along the line of less weight per horsepower and toward the ideal of a drawbar pull equal to the weight of tractor under standard conditions.

It is the object of this paper to analyze some of the factors that have influenced tractor development, with the hope that a statement of these will aid any thoughtful student of tractor engineering to form his own conclusion regarding the ultimate type of engine.

## Conditions Influencing Development

The old type of tractor was built with the belief that high traction ability depended entirely on weight, a mistaken idea based on the supposition that road friction was the governing factor in a tractor's ability. This led to design of tractors whose weight was much greater than that of any other moving vehicle; highway bridges for agricultural districts were designed having a maximum load capacity equal to or greater than the weight of the largest tractors. Enormous engines were required to propel these tractors, and many of them labored under the handicap of having only 20 per cent of the horsepower developed available for traction in average soil, owing to the high tractive resistance and inefficient transmission mechanism.

As the development goes on, the usefulness of the tractor becomes broader. The number of farmers who can afford them is increasing, because of the decreased price; the reliability is becoming greater and the possible applications more numerous. The usefulness of tractors increases as:

- 1—Weight of tractor per horsepower developed decreases.
- 2—Weight of engine per horsepower decreases.
- 3—Transmission losses decrease.
- 4—Tractive ability of drive-wheel becomes greater.
- 5—The longitudinal center of gravity of tractor and the drawbar hitch are more effectively placed.
- 6—Output of useful work in unit time divided by the initial cost increases.
- 7—Total cost per unit of work done decreases.
- 8—Price of tractor approaches the average income of farms that are suitable for tractor application.

9—Range of conditions under which the tractor can operate successfully broadens.

10—The tractor can do a number of things well on the farm.

11—Knowledge of the care and operation of its component parts becomes prevalent among farm users.

12—As the following questions regarding the tractor can be answered to the satisfaction of the farmer:

a—How many plows can it handle?

b—How much does it cost?

c—Will it burn kerosene?

d—What else can it do besides plowing?

e—How long can it last?

f—Is the engine the same type as in his car?

g—Can he get repairs promptly?

An analysis of these twelve factors would cover the entire art of tractor engineering. We must therefore proceed with the discussion of those factors relating to the powerplant.

We will have defined a type of engine if we can establish general specifications that will make for tractor usefulness in the following respects: (a) range of horsepower for the tractors that can be used on the average farm; (b) most logical cycle for such service; (c) number of cylinders; (d) mean effective pressure required; (e) fuel range; and (f) governor control.

It is generally conceded that all tractors satisfactory for plowing must have ability to pull not less than two plows on the average soil. At least 90 per cent of all farms can be worked with two to four-plow tractors, taking 10 hp. minimum and 20 hp. maximum at the drawbar. Various power demands on the farm exceed 20 hp. and it is useful to have an engine delivering 30 hp. The tractor engine that will do most of this work does not exceed 35 b.hp. The remaining 10 per cent of the farms will require between 35 and 70 hp. We are chiefly interested in the ultimate engine for the 90 per cent and can therefore figure on engines of between 16 to 40 hp. In establishing these limits we must consider the increased tractor efficiency to be expected in the future and also the low efficiency in some larger types of tractors; we can do this by allowing 8 b.hp. per plow for the most efficient and 10 b.hp. for the least efficient construction.

## Available Cycles

The brake horsepower desired from an engine has a profound influence on the cycle, since the area and design of the combustion chamber determine the power produced from any cycle.

Undoubtedly the future holds much in store for the development of engines operating on the Diesel and semi-Diesel cycle, but it is doubtful if their weight can ever be decreased to such an extent that their greater efficiency will overcome the disadvantages of the decreased traction efficiency due to their great weight. In the distant future, when there is a real shortage of the lighter fuels, it may be necessary for mankind to use an engine that will burn the heaviest oils.

The two-stroke cycle engine with its simplicity seems ideal,

but up to this time attempts to make a reliable and economical engine have failed. The complications resulting are far worse than those that the cycle attempts to correct.

Other new cycles are being proposed from time to time, but every demand of successful tractor operation seems to be fulfilled by the four-stroke cycle engine. Not the least of its advantages is the intimate knowledge the farmer has of the cycle, resulting from his experience with his automobile, stationary engine and the gas tractor as built up to this time.

The horsepower per cubic-inch displacement or the weight per horsepower cannot be improved by any other cycle, all other things taken into consideration. We must therefore consider that the four-cycle engine is and will be the most suitable for tractor service and will be the ultimate type.

**Four Cylinders Best**

The indications are that there is a tendency toward four-cylinder engines. No doubt this tendency is strongly influenced by the prevalence of that type on automobiles. The satisfaction it is giving in sizes between 16 and 40 hp. in automobile and tractor service is the influence that is making four cylinders the standard. Several successful tractors are equipped with two-cylinder horizontal-opposed engines; these have worked very well, considering the difficulties inherent in their design. These can be summarized as follows:

1—The tendency for the shaft to revolve longitudinally in the plane of the crankpins due to centrifugal, inertia and gas forces. This tendency loosens the main bearings by throwing the shaft out of line. The crankpin bearings ride alternately on one side of the pin and then the other, causing damage and necessitating frequent adjustments and replacements.

2—Great weight of reciprocating parts compared with the brake horsepower, augmenting the difficulties enumerated under (1).

3—The high centrifugal forces as compared with the brake horsepower, resulting in effects as listed under (1).

4—Difficulty in cooling the large piston and valve heads necessary in obtaining 20 hp. per cylinder.

5—Difficulty of maintaining a perfect mixture in the long intake header as well as the impossibility of attaining high volumetric efficiency with the high velocity necessary for maintenance of mixture quality.

6—Difficulty in lubricating all parts sufficiently without over-lubricating the cylinder.

7—The disadvantageous location of the valves.

8—Infrequency of impulse, the lack of balance and its influence on the transmission mechanism.

The history of internal-combustion engines of all types and number of cylinders is a succession of efforts to increase both the working speed and mean effective pressure. Investigation of internal-combustion engines has developed an empirical formula (1) that gives the speed at which the average engine works most satisfactorily. The formula takes into consideration the weight of reciprocating parts, efficiency of cooling and lubricating systems and the rate at which inertia forces vary with speed.

$$S = \sqrt{\frac{3,000,000}{0.04545 B^3}} \tag{1}$$

In which *S* is the most satisfactory working speed; the factor 3,000,000 depends on the cooling and lubricating-system efficiencies and on the general state of the art; *B* is the bore of the engine; and the expression  $0.04545 B^3$  is an approximation for the average piston weights.

In Fig. 1, *S*<sub>1</sub> shows the relation of working speeds and bore, while *M*<sub>1</sub> is plotted between allowable maximum brake mean effective pressure taken at the speed of maximum torque.

From past experience it is obvious that small bore engines are much better power producers because they are much favored in both the matter of speed and mean effective pressure. Inasmuch as four-cylinder engines capable of pro-

ducing a maximum of 40 hp. can be equipped with small cylinders, it seems reasonable to feel that such an engine will be particularly well adapted for tractor service.

**Combustion-Chamber Area**

There is an important, though as yet undetermined, relation between the combustion-chamber wall area and its volume; this relation is a governing factor in determining the compression at which an engine can run satisfactorily. Compression and volumetric efficiency determine the mean effective pressure and influence economy favorably. The larger ratio of wall surface to volume in small bore engines makes the problem of cooling easy in the four-cylinder type. Piston heads of diameters up to 5 in. are not difficult to cool. Valves up to 2 1/8 in. clear diameter can be cooled satisfactorily, and inasmuch as 20 hp. can be developed per inch of valve diameter at the speed indicated by Curve *S*<sub>2</sub>, Fig. 1, we have another evidence of the advantage of the four-cylinder engine for tractor service.

Inertia forces, which vary roughly as the cube of the bore, have been found to be the principal cause of crankpin-bearing destruction. Our experience with thousands of tractor engines strongly corroborates this statement. In fact we design engines understanding that they will operate, not at the speed set by the governor, but at a slower speed of higher torque caused by the load being always greater than the engine can handle at governed speed. With the cooling properly taken care of our experience is that the length of the period between adjustments is a function of lubrication efficiency and the total number of revolutions. Having built an engine that will cool properly our test is to see how many million revolutions the engine can run between major adjustments. All things considered no other engine of ours has yet equaled the performance of a four-cylinder engine, which in service has run 420,000,000 revolutions with four adjustments of the connecting-rods and three adjustments of main bearings, finishing in good shape with the original valves, pistons, rings, bearings and crankshaft. This no doubt has been duplicated by other four-cylinder engines.

For the purpose of discussing four-cylinder, four-stroke cycle vertical engines from the standpoint of fuels, other than high grade gasoline, it is necessary to revert for the moment to the question of combustion-chamber walls. Because of the readiness and lower temperature at which the lower grades of fuel crack into higher and lower hydrocarbons the necessity for better control of maximum cylinder-

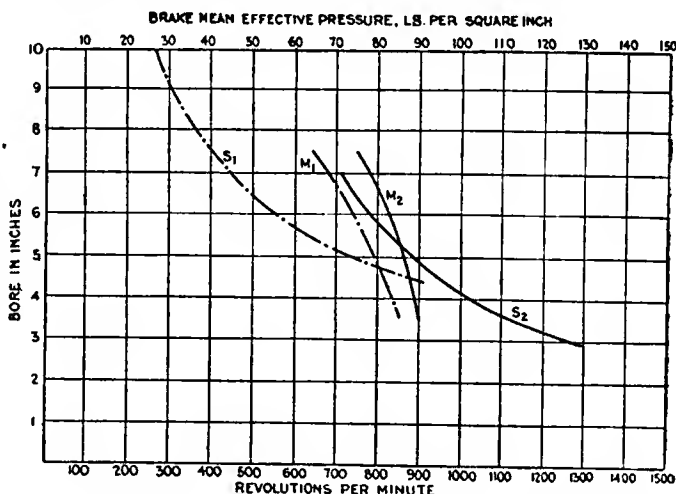


Fig. 1—Relation of cylinder bore to speed and mean effective pressure

*S*<sub>1</sub>—Curve of past experience in speed; *S*<sub>2</sub>—Curve of modern experience in speed; *M*<sub>1</sub>—Curve of past experience in mean effective pressure, and *M*<sub>2</sub>—Curve of modern experience in mean effective pressure.

wall temperatures points toward a range of bore and wall-area ratio to volumes that will give the best results through the automatic thermostatic effect of mere combustion-chamber dimensions.

Four-cylinder engines of either L-head or valve-in-head types fulfill these conditions between the cylinder bore sizes of  $3\frac{1}{2}$  to 5 in., which correspond to the range of 16 to 40-hp. sizes demanded for tractor service. Above 5-in. bore engines tend to become "hot," and the cylinder wall is favorable for vaporization due to conducted and radiated heat given off at the slower speeds; below  $3\frac{1}{2}$ -in. bore wall temperatures are too low, but great turbulence due to higher speed of the smaller engine helps to overcome the lower wall-temperature effects. The cylinder walls for burning kerosene should be as hot as possible without danger of a local high temperature sufficient to crack any part of the fuel. This usually occurs near the exhaust valve.

In working out the combined intake and exhaust manifolds that vaporize the fuels in the mixture during its passage to the cylinder the convenient proximity of the intakes and exhausts makes the L-head and valve-in-head types of cylinders the most frequently used. Tractor engines operate from 50 per cent to full load practically all the time and with comparatively small variation in speed. The four-cylinder, four-cycle engine is therefore easily applicable to burning kerosene, inasmuch as so far as vaporization is concerned the only difficult condition to be met is that which occurs when the engine is throttled.

Because of the narrower explosive-mixture range or air-to-fuel ratios, all of the above favorable factors combined to permit the practical burning of kerosene more easily in the four-cylinder than in any other type.

We have established an ultimate type of tractor engine when we say it shall be a four-cylinder four-stroke cycle vertical engine capable of delivering from 16 to 40 hp. continuously without showing distress at full or overload and of running at speeds varying between 750 and 1230 r.p.m. according to the bore. This engine should run, under favorable conditions, 40,000,000 revolutions between crankpin-bearing adjustments, 80,000,000 revolutions between adjustments of main bearings and 43,000,000 revolutions between grindings of valves.

Having decided upon a definite type, it may be well to enumerate the general elements of design that need the most attention.

1—A careful layout of the combustion-chamber in order to secure a high uniform temperature of the walls; this means no pockets for steam in the jacket, and a correct direction of cooling-water flow.

2—Valves arranged to secure favorable heat flow in the exhausts toward the water-jacketed seat and valve guide.

3—Piston head cooled so as to keep temperature of its center below cracking point of fuel.

4—Efficient circulation of water about the spark-plugs.

5—Pistons and rods of light weight.

6—Piston and rings with clearance so as to secure high-temperature performance at medium speed.

7—Stiff crankshaft of material of high elastic limit to withstand abrasion with ample main and crank bearings, particularly center main bearing.

8—Lubrication system designed to convey extraneous heat of piston lower cylinder wall, crankcase bearing webs and sides into a sump in which cooling means can be provided to dissipate such heat. The lubrication should be such that if any part fails, auxiliary systems are always at work to prevent sudden failure of bearings and great damage to the engines. The high bearing pressures and temperatures necessitate the use of medium and heavy oils. Breathers that prevent sand and dust from entering the engine should be used. When either the present gasoline or straight kerosene is burned, the increasing content of kerosene results

in a rapid drop in viscosity. The oil should therefore be renewed frequently.

9—Crankcase is best in design that is the stiffest and dissipates heat the best.

10—Heavy flywheels to meet sudden peak loads and thus relieve the crankpin bearings of the most severe pounding that they receive.

11—Air cleaners should be used to remove the dust and sand from the entering air.

12—A self-contained governor of both the maximum and constant-speed type is important.

#### Requirements for Kerosene Burning

13—Provision for burning kerosene. This involves the following considerations:

a—In tractor service when the load remains at over half the full value, kerosene gives reasonable satisfaction, provided properly proportioned combined intake and exhaust manifolds be used and the starting be made on gasoline.

b—Under such conditions the loss in volumetric efficiency due to heating the intake charge results usually in a decrease from 10 to 20 per cent in the maximum horsepower output, whether gasoline or kerosene is used.

c—When the engine speed increases, the necessity for heat in the intake is less, while when the speed decreases more heat is necessary in the intake. At full speed and power output, slight heating of intake will suffice.

d—A properly designed combustion chamber, removing the necessity of water injection, is required.

e—The principles of the science and art of burning kerosene, as indicated by my experience, are set forth in several papers by Dr. Charles E. Lucke, and the author testifies to the correctness of his conclusions.

f—A kerosene engine does not carbonize any more than does a gasoline engine; in fact, it stays cleaner than the gasoline engine if the fuel is only comparatively well vaporized.

g—When kerosene is well vaporized so that the mixture reaching the cylinder is in a dry state, a kerosene engine with a correctly designed combustion chamber will not be heated so much as will a gasoline engine.

h—In burning any grade of fuel the carbureter meters and atomizes the fuel; the manifold vaporizes the mixture; the combustion chamber burns it. Of all these the carbureter is the most nearly perfect. The manifolds are next in efficiency. The engines in their present form are the least able to perform their functions in attempting to burn kerosene. The development therefore of kerosene-burning in engines of the prevalent types should start with the engine and end with the carbureter.

There is no doubt that the greatest criticism of the four-cycle engine is its low thermal efficiency. The future certainly has great things in store for the improvement of this cycle. Perfected systems of spraying the fuel under pressure may offer great opportunities for improvement in the four-cycle as well as in the semi-Diesel type.

The use of heavy fuels is bringing to the front the wonderful possibilities of the newly-developed high-pressure steam boilers. The boiler has been the weak point in steam-driven vehicles but the modern high-pressure type, which delivers superheated steam at a pressure of from 800 to 1000 lb. per sq. in., taken together with the four-cylinder vertical single-acting poppet-valve type of uniflow engine is producing results in thermal efficiency that rival the average performance of the four-cycle internal-combustion engine—particularly when burning cheap oil. After all it is a serious matter to carry the fire box in the cylinder and also to keep the latter clean.

The determination of the ultimate type of tractor engine is really a problem needing the cooperation of engineer, salesman, consumer and manufacturer.

# New Accessories Appearing at New York Show—II

Description of New Devices and Improvements in Established Accessories Continued from Last Week—New Things of Interest to Engineer, Manufacturer, Garageman and Car Owner

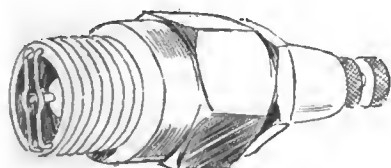
**T**HERE were so many new accessories and so many instances where well known and established devices had been improved in design and construction brought out at the New York automobile show last week, that it was impossible to describe and illustrate them all in one issue. The descriptions are continued herewith:

### Z-Ro-Hot Moto-Primer

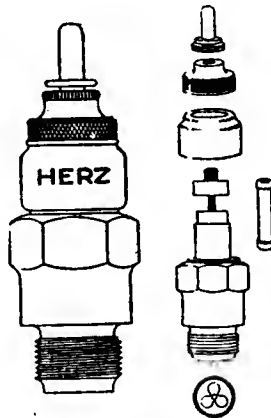
A tube connection between carbureter and manifold in conjunction with an electric heating coil and dash-operated valve form this device. When the valve is opened from the dash an electrical contact is made and the coil becomes heated. Cranking the engine draws gasoline from the carbureter through the heating coil so that it enters the cylinders in a partly vaporized state, rendering starting easy. The valve is then closed and the electrical current switched off. The device may be fitted to any car and sells for \$12.50.—Motor Engineering Co., Detroit.

### Herz Bougie Mercedes

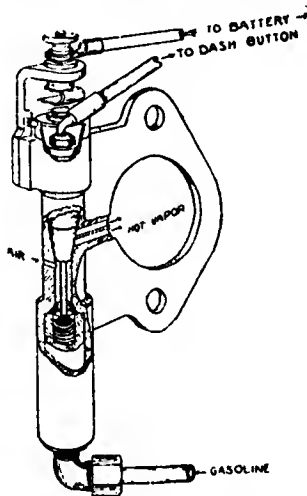
A newly-developed insulation, consisting of three parts, an inside stone, a mica cartridge and an outside stone, is a feature of this plug in the following threads, 3/8 by 18 and 1/2-in. type only for types A, B, C, D, E, F, G, H and I. The inside stone is larger and has a large bore, permitting the introduction of the mica cartridge in which the hexagonal headed inside screw is surrounded by India mica wound to a cylinder with each of the ends secured by a copper tip. The hexagon head of the screw fits into a recess in the lower part of the inside stone. The outside stone is large and further protects the two inside insulations. The top nut can be used as a thumb nut or with any terminal. The patented cloverleaf electrode is made of Herz platinum alloy and furnishes three



New Mosler spark plug



Herz Bougie Mercedes



Z-Ro-Hot Moto-Primer

spark gaps. The plug sells for \$1.50.—Herz & Co., New York.

### New Kellogg Pumps

A new crankshaft drive pump for 1916 and 1917 Overlands and for 1917 Dodge and Chandler cars. This is attached to the shaft in the same manner as the starting crank, a pin serving to hold it in place when in use. At other times it is carried in the tool box. To prevent injury of the poppet intake valve this is in the piston. The lubricating is by oil-soap felt packing, so that no grease or oil is carried in the base. Metal rings insure good compression and it is impossible for oil to get into the air pumped to the tires. This pump sells for \$10, including air hose, gage, etc.

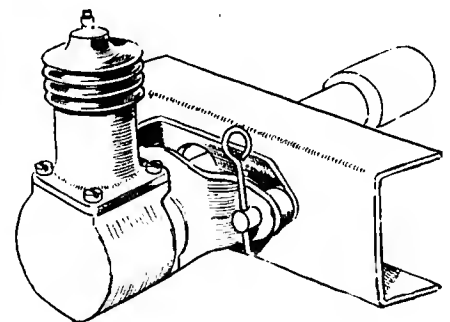
A feature of the Kellogg line of engine-driven tire pumps is model 101, which is designed for installation in most of the popular-priced cars with little machine work or fitting. The pump is all metal, having forged babbitt-line bearings, and the pistons are constructed to prevent oil leakage. Price, \$15, complete.—Kellogg Mfg. Co., Rochester, N. Y.

### New Mosler Plug

This is the first time this plug has been exhibited at a show. The noticeable feature is that the insulator has a double hub or shoulder on it so that the nut which holds the insulator in place bears on the upper shoulder. Thus the pressure between this point and the lower shoulder is more evenly distributed and there is less danger of breaking the insulator. Price, \$1. It is guaranteed to outlast the motor.—A. R. Mosler & Co., Mount Vernon, N. Y.

### Lane Bros. Jack

A 36-in. extension handle raises or lowers the car without the driver getting under it. In construction the jack proper is similar to the standard Lane jack, the feature being this extension handle by which the jack is controlled. To raise the car the handle is pushed all the way into the socket; to lower it is only necessary to pull it towards the operator. The jack is made in four sizes, No. 14, 10 to 16 1/4 in. lift, 1800 lb. capacity, for \$3.50; No. 15, 11 1/2 to 19 1/4 in. lift, 1800 lb. capacity, \$3.75; No. 16, 10 1/4 to 16 1/2 in. lift, 3000 lb. capacity, \$4.75; No. 17, 11 1/4 to 19 1/2 in. lift, 3000



Kellogg crankshaft drive tire pump

lb. capacity, \$5.—Lane Bros. Co., Poughkeepsie, N. Y.

N. Y. Coil Co. Devices

At the booth of the New York Coil Co. is a new safety steering device for Fords, which consists of a bearing with projecting sides bolted to the steering column at an angle so that the projection at one side is below the supporting rod, the other end being above the corresponding rod on the opposite side. Price, \$1; also the Thermo-Electric primer, comprising a heating coil which surrounds a connection between the gasoline supply from pipe, bottom of carbureter or vacuum tank, and is screwed into the intake pipe, where it is operated by a small lever on the instrument board. The primer costs \$5 and fits any car.

This completely new system features extreme flexibility and high efficiency. It is asserted that the car may be throttled down to a walk, and then accelerated to full speed without skipping or jerking. It is operated by six dry cells, which supply sufficient current for 2000 to 4000 miles' running, leaving the Ford magneto to furnish lighting current exclusively. The system comprises a non-vibrating transformer coil, which is capable of producing an intense spark needed for the ignition of low-grade gasoline, and a combined breaker and distributor mounted on the standard Ford timing shaft, but in a vertical position. Price, \$20.—New York Coil Co., New York.

J-T Windshield Cleaner

The J. T. windshield cleaner is rust-proof, enameled in black and does not interfere with top, curtains or windshield supports, being mounted on the windshield directly in front of the driver so that the rubber wipes the glass clean and dry, affording a clear view. The cleaner sells for \$2, attached, and is made by the J. T. Auto Devices, Cleveland.

The Handy cigar lighter has a heating coil, and pressing the button sends cur-

rent through resistance wires, making them almost white-hot. A draught circulates through the device when not in use. No. 1 lighter sets flush with woodwork or trimming, No. 2 attaches in any position without cutting into the car, and No. 3, a non-reel type, has a spring bracket. The reel types are automatically rewound when released after using. When wound all current is cut off. No. 1 and No. 2 lighter, \$6; No. 3, \$2.50.—A. J. Picard & Co., New York.

Perfection Heater for V-Engine Cars

Perfection heater models are now made also for Cadillac eights and Packard twin sixes. There is an inlet at each end to take care of the exhaust gas from each type and an outlet in the center. The Cadillac type, with oxidized brass housing ready to install, sells for \$32.50. For a floor type heater the standard type A can be connected to each exhaust pipe, this outfit costing \$31. In the Cadillac Victoria the type A should be connected to the right hand exhaust pipe only; price, \$25.—Perfection Spring Service Co., Cleveland.

Petry Cut-Out for Fords

A new Petry cutout for Fords which sells for \$3 complete with pedal and chain is shown at the Petry exhibit. This differs from the standard model only in the shape of the lever, which is changed to facilitate mounting on the Ford. No adjustment is required on the lever. The Petry company has also prepared a very complete list of cars alphabetically arranged in 1914, 1915 and 1916 models, with the size of cutout required for each. The Anthony single-acting single-cylinder hand tire pump is also

exhibited. Price, \$4.—N. A. Petry Co., Philadelphia.

Pittsburgh Parabolite Spotlight

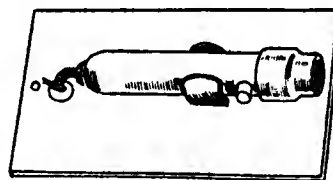
A 7-in. spotlight with brackets for attachment to any car and incorporating a Cutler-Hammer switch in the handle, features a 6-in. patented Parabolite main reflector of brass with a heavy silver finish, which directs the light rays in a parallel beam. A simple and positive focusing attachment is provided whereby the rays may be concentrated at any desired point, and the 4-in. diminishing mirror attached to the side of the lamp enables the driver to see to the rear. Price, \$7.50.—Pittsburgh Electric Specialties Co., Pittsburgh.

Parker Rust Proofing

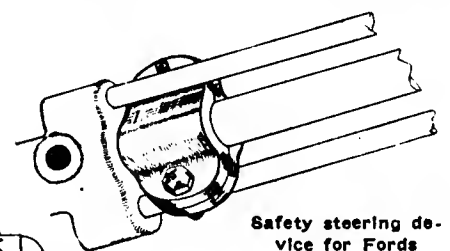
A highly adhesive rustproof process, preventing scaling or peeling, is being featured by the Parker company, which is exhibiting various articles treated with its product. The Parker process makes an absolute base for japan, enamel or paint and increases their life and appearance.—Parker Rust-Proof Co. of America, Detroit.

Plunkett Electric Gasometer

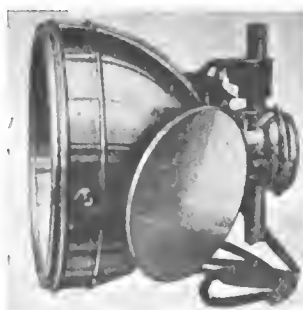
The Plunkett device, which is on exhibition in the salon at the Hotel Astor, has an indicator for mounting on the dash to show the amount of gasoline in the fuel tank and which throws on a warning light when the supply has dropped to 4 gal. There are three parts—a float, which progressively makes and breaks an electric circuit as the fuel level changes; a dash-mounted indicator having small electric lights behind numbers cut in the dial, and a single dry cell with wiring connecting the other two units. Pressing a button on the dash



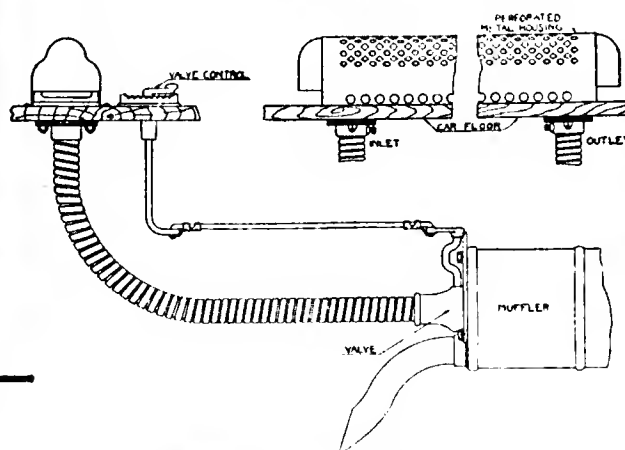
Handy cigar lighter



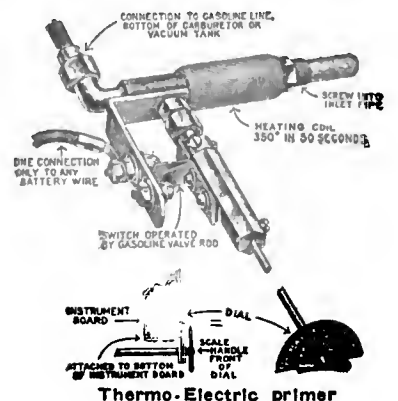
Safety steering device for Fords



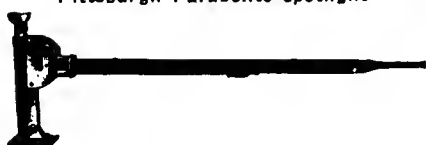
Pittsburgh Parabolite spotlight



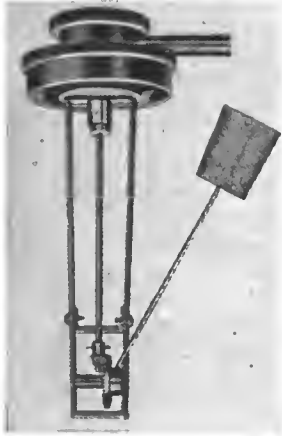
Illustrating Perfection heater operation



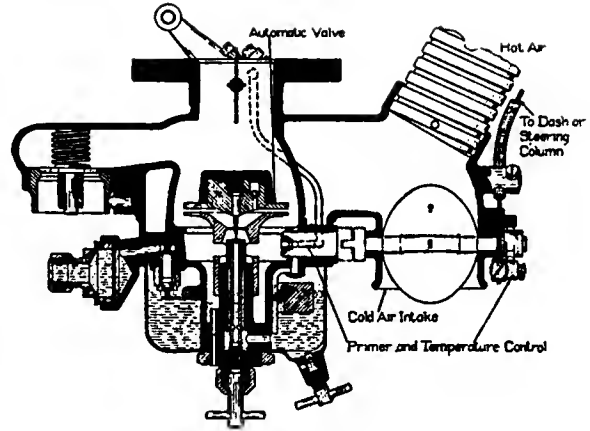
Thermo-Electric primer



Lane Bros. extension jack



Plunkett electric Gasometer fuel indicator



Shakespeare carburetor, showing primer

meter illuminates the number showing the amount of fuel in the tank. The automatic warning light is in the center. The Gasometer fits any car and sells for \$15.—Plunkett Electric Gasometer, New York.

**Sparton Vacuum Feed**

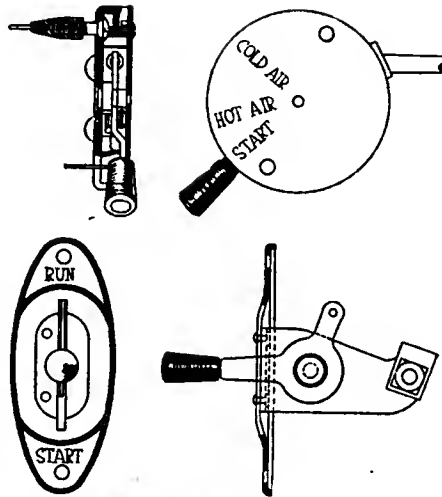
That it is the smallest, simplest and most efficient vacuum tank are the claims made for the Sparton device. The tank holds about 1 qt. It is divided into two chambers, the upper one being suction and the lower, discharge. The upper chamber is connected to the manifold and to the gasoline tank and a float operates the valves. Flow to the lower chamber is continuous through a flap valve and gasoline in the lower chamber is maintained at a constant level in it. It is said that the tank cannot be drained under high speed with throttle wide open and that 5 sec. of cranking is sufficient to fill the tank when it is empty. The vent to the upper chamber is connected to the lower one by a small pipe, so that there is no danger of gasoline splashing out when the upper chamber is full.—Sparks-Withington Co., Jackson, Mich.

**New Shakespeare Controls**

To meet the S. A. E. standard 1 1/16-in. throw for carburetor controls, the Shakespeare Co. has brought out controls to this dimension for both dash and steering wheel mounting and has found a large demand for these new products. An improvement has also been made in the Shakespeare automatic carburetor in that it now incorporates a patented primer consisting of a tube leading from the mixing chamber to a point above the throttle, so that the primer functions separately, delivering a gargled mixture of fuel and air directly into the manifold, which greatly facilitates starting, especially in cold weather.—Shakespeare Co., Kalamazoo, Mich.

**Victor Heater for Fords**

The Victor heater may be applied to a Ford in 30 min., requiring no change in the car and no special skill for fitting.

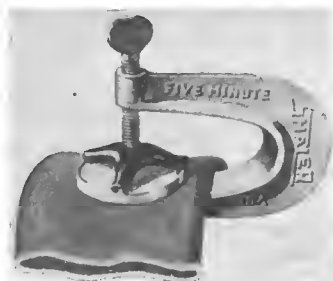


Shakespeare 1 1/16-in. throw carburetor controls

It is operated by the exhaust gases and consists of a metal box with a radiator at the top, which takes the place of one of the floorboards, the heater being supplied complete with a section of floorboard. The only cutting necessary is a V-shaped aperture in the exhaust pipe, over which the heater pipe is clamped. The device, which costs \$5, is manufactured by the Victor Heater Co., Camden, N. J.—W. E. Pruden Hardware Co., New York.

**Shaler Vulcanizers**

The Five-Minute vulcanizer is a new Shaler design for mending tubes, in which heat is produced by burning a chemically treated disk about the size of a silver dollar. Each of the twelve



Shaler Five-Minute vulcanizer

patches furnished with the outfit is complete in itself consisting of the patent heat unit in its metal container and the patch of raw rubber to be patched to the surface of the container. The complete container is clamped over the puncture and the heat unit is lighted. In 5 min. the repair is done and there is no danger of overcuring. Anyone can do the work. Price, \$1.50; extra patches and heat units, 75 cents.

A complete steam vulcanizing plant with capacity for two cases and five tubes is a new design which resembles a continued model except that there is provision for two casings instead of one. It may be had either with gas or gasoline burner or both. Price, \$85.

A bench tube vulcanizer with capacity for four tubes and operated by steam in connection with a gas or a gasoline burner, is a new model. Steam may be



Sparton vacuum fuel feed tank which incorporates two chambers, the upper for suction and the lower for discharge. Only 5 sec. of cranking is required to fill the tank when empty



Victor heater for Fords



raised in 15 min. and is maintained at the proper pressure by thermostatic control. It is equipped with steam gage and safety valve. Price, \$25.—C. A. Shaler Co., Waupun, Wis.

**New Schrader Tire Valve**

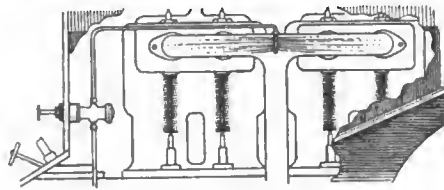
The new Schrader inflating valve is smaller and is rubber covered. It resembles a spool except that there is a connection at one side for the air hose. In spite of the reduction in size the air passage has been enlarged to give quicker inflation and the substitution of conical washers in place of flat washers removes all possibility of air leakage.—A. Schrader's Sons, Brooklyn, N. Y.

**Spray Primer**

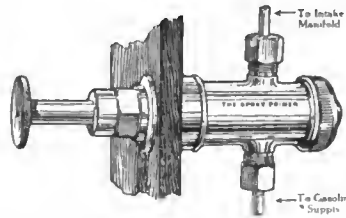
The Spray primer is a small injector pump with the operating button attached to the inside of the dash or floor board drawing gasoline from the supply line and forcing it into the intake manifold. It may be attached in less than 1 hr. and requires no soldering. Price, \$7.50.—Spray Primer Co., 11 Pemberton Square, Boston.

**New Splitdorf Ford Plug**

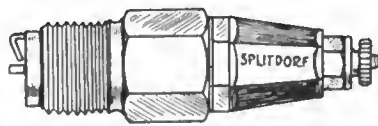
The plug made for Ford cars has been changed in many particulars. A fish-hook electrode is now used and the interior construction has been improved. A new plug designed for tractor work,



Spray primer mounting on engine



Detail of Spray primer dash mounting



A new Splitdorf plug for Fords

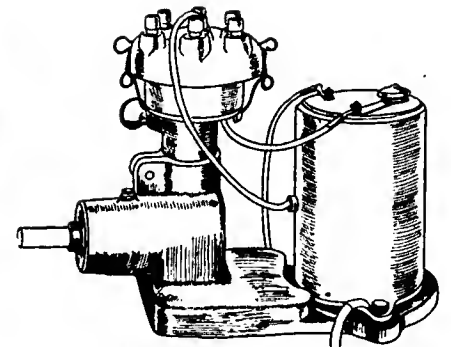
but which may also be usable for standard pleasure engines, is known as the heavy Hex model. Its feature is that it is a very heavy hexagon by which it may be screwed in very tight into the cylinder. A combination voltmeter and ammeter designed for flush mounting on the cowl has been added. It shows charge or discharge in amperes, and by pressing a button at one side, the voltage is registered.—Splitdorf Electrical Co., Newark, N. J.

**Stentor Autophones**

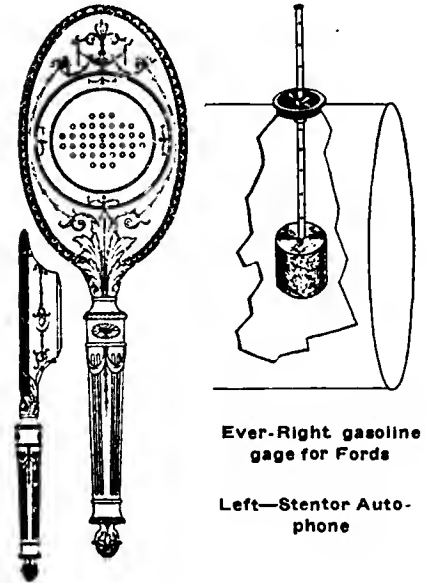
The Stentor is a complete and distinctive line of autophones with mechanical construction practically the same throughout, an electrical device permitting the occupant of the rear compartment of the enclosed car to direct the driver. The autophones may be had in practically any desired design or finish. One set, the No. 9, has transmitter of sterling silver decorated in enamel to match the upholstery of the car and carries a mirror on the reverse side. Prices range from \$25 up.—Stentor Electric Mfg. Co., Inc., New York.

**New Stevens Devices**

In addition to their line of reamers and other tools for Fords and other makes of cars, Stevens & Co., New York, are showing some new devices, noteworthy among which are a running board mat, price \$2, made of transverse rods covered with leather rings with each rod linked to the next by a series of leather strips; and the Ever-Right gasoline gage for Ford cars. This gage comprises a shallacked cork float secured to a metal bobber, notched to indicate the amount of gasoline in the



New Splitdorf magneto mounting



Ever-Right gasoline gage for Fords

Left—Stentor Autophone

tank. Price, \$1.—Manufactured by Ever-Right Products Corp., New York City.

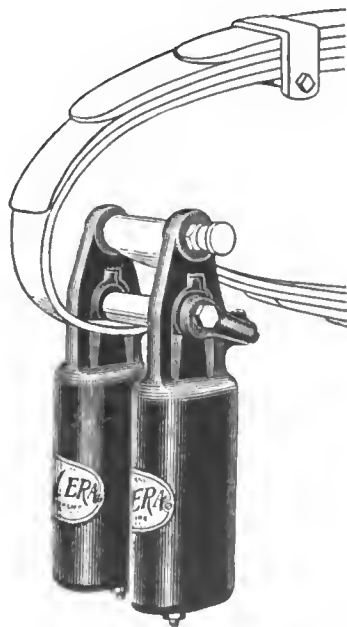
**A Twin New Era**

The main improvement in this absorber is the addition of a new radius link that takes care of side sway and permits a freedom of action formerly impossible on elliptic absorbers. Attached to the upper end of shock absorber plungers are pivoted links which are attached to the frame of the absorber. Price of twin elliptic absorber for a 2300-lb. car is \$12 for the rear spring set; for a 2300 to 3000-lb. car, \$12.50; for 3000 to 3800-lb. car, \$13.50, and for a car over 3800 lb., \$15.—New Era Spring & Specialty Co., Detroit.

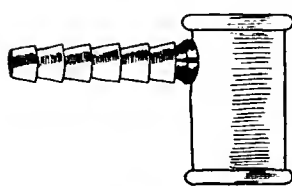
**New Wagner-Hoyt Units**

The Wagner-Hoyt company exhibited a complete line of electrical equipments, including motors, generators, battery and magneto ignition units. In the generator line there are four types. These are all Ward-Leonard instruments weighing respectively 10, 15, 18 and 24 lb. and having capacities of 8 amperes for the 10-lb. instrument and 10 amperes for the others. The Ward-Leonard system of control is used with each.

Two types of starting motors are manufactured, both being four-pole



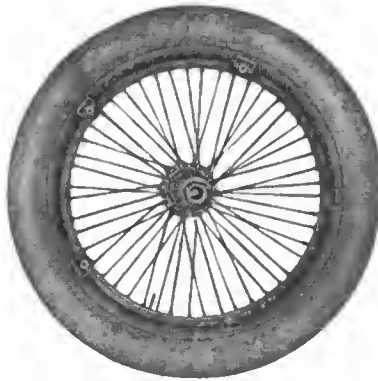
Twin New Era shock absorber



New Schrader tire valve



Superior radiator shell for 1917 Fords



Superior wire wheel for Fords, with demountable rim

series-wound units and are built for both 12-volt and 6-volt systems.

The W-H battery ignition set consists of an interrupter, spark coil and condenser, distributor and switch. A feature of the breaker mechanism which is a simple cam-operated type, is that it is lubricated by a felt roller which keeps the internal friction at a minimum.

The magnetos are made in two styles, the W-H and the Volta. The W-H is a two-spark per revolution type of high tension instrument with the distributor self-contained. The Volta is a distinctive type with waterproof qualities.

Thin plate batteries for use with the ignition starting and lighting systems are shown, together with a line of switches, meters, cables, etc.—Wagner-Hoyt Electric Co., New York.

**Superior Line Larger**

New things in the Superior line comprise a radiator shell for 1917 Fords, wire wheels for Ford cars with demountable rims and numerous other products. The radiator shell has an apron attached covering the Ford front axle, the shell having a V tapering top, designed to give an elegant effect when slipped over the radiator. The regulator hood is retained. Price, in black finish, \$8; nickel finish, \$10.50. The wire wheels with demountable rims are furnished complete with ball cups, dust caps, wrench, nuts, etc., the right front hub being arranged for speedometer gear and the rear hubs with brake drums, etc. Use of demountable rims obviates possibility of spokes working through the rims and pinching the inner tubes. A set of four wheels complete with rims weighs 130 lb. There is one extra demountable rim included in the price of \$40. The wheels are finished in black baked japan with nickel-plated caps. The Superior company is also showing a large line of various types of custom made brass and nickel lamps for special body work in addition to its regular line of automobile lamps. The line also includes special products for Ford cars, such as radiators, stream line

hoods, windshields, crowned fenders, running boards, etc.—Superior Lamp Mfg. Co., New York.

**Wilson Tire Holder**

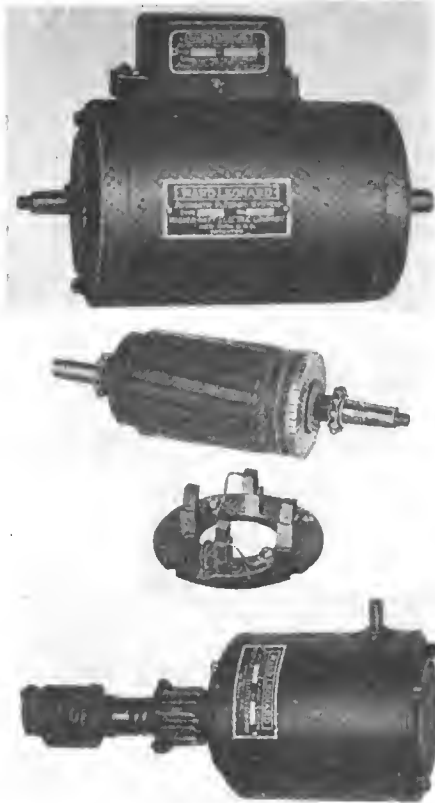
This rear tire carrier for Fords is secured to the rear crossbar by means of two U-bolts and tie-plates. The latter grooved to provide a positive lock on the channel steel side bars, without cutting or drilling the car frame. The lamp bracket and license carrier are integral with the tire carrier and are also adjustable and by means of a snap lock the tire may be padlocked in place on the rack. Price, \$5.—P. W. Stewart, Chicago.

**Hoskyns Tops**

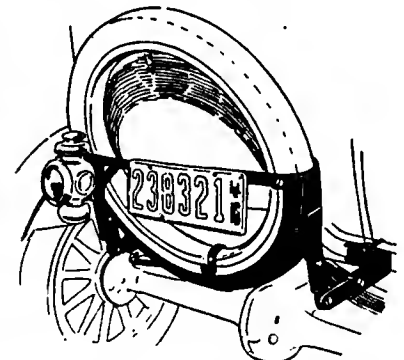
A number of detailed improvements feature these detachable tops for Fords, Maxwell, Chevrolet and other popular priced cars. The rear and lower side sections are pressed out in oil and take a very fine paint finish, also they are waterproof, light and durable. Windshield and windows are plate glass and the windows are removable. Price for Ford touring car, \$125; Ford roadster, \$110; Overland country club, \$135; Chevrolet roadster, \$110, and other cars in proportion.—Universal Motor Products Co., Indianapolis.

**Weston Electrical Devices**

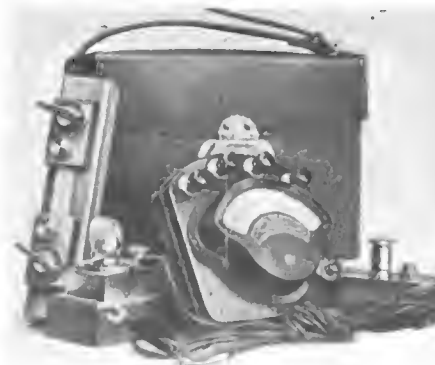
The Weston electrical testing set for the garage, designed to locate all troubles of electric starting and lighting systems, consists of a voltmeter, milli-volt meter, ammeter, milli-ammeter, and voltmeter,



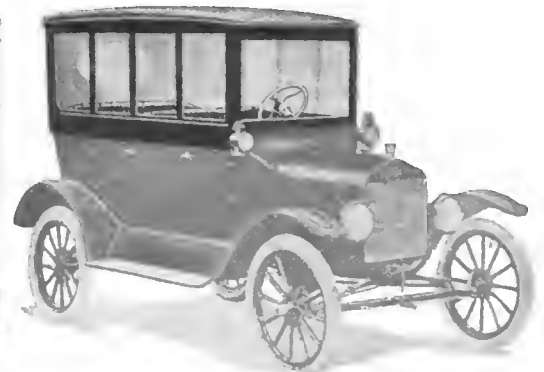
New Wagner-Hoyt electrical units. At the top is a generator with regulator, in the center an armature with brush assembly and at the bottom is a starting motor



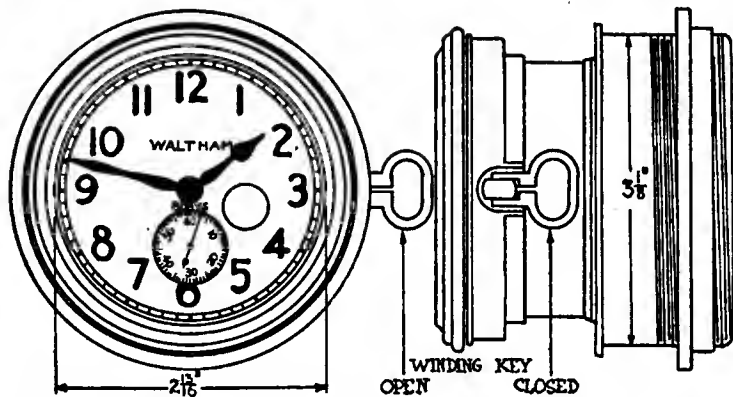
Wilson combination tire, lamp and license plate holder for Fords



Weston electric outfit for testing electrical systems



Hoskyns demountable tops are made for most popular-priced cars



New Waltham telescopic clock of double telescopic cowboard design. It is about twice as thin as the model brought out over a year ago

together with all shunts and connections necessary for the testing work, packed in a pocket size leather case convenient for road work. The use of the instrument is varied, some of them being determination to run down batteries, short circuits or grounds, defective lamp sockets, open circuits, brush troubles in the motor or generator, etc. A full description of the method of making connections for the various uses are included with the instrument. Price of model 280 is \$22.50.—Weston Electrical Instrument Co., Newark, N. J.

**New Waltham Model**

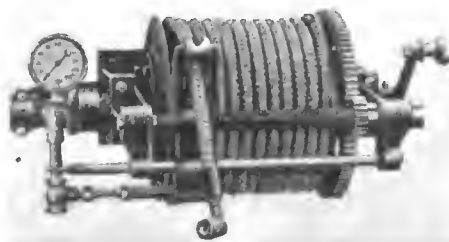
A new flush type Waltham speedometer with black or silver dial, 1000-mile trip and 100,000-mile season odometers is shown which has an especially quick reset. A knurled knob is turned to set the trip figures back, and when it is desired to do this quickly, holding down a small button gears up the drive ten times, so that when the knob is turned the figures are set back ten times as fast as ordinarily. The telescopic clock which was brought out over a year ago is now a double telescopic design and consequently is about twice as thin as formerly. The clock is a cowboard design which is particularly neat.—Waltham Watch Co., Waltham, Mass.

**Boyce Moto-Meter Emblems**

A large selection of emblems is offered at no extra charge to purchasers of the largest Boyce Moto-Meter. These emblems include car name plates, club insignia, fraternal emblems and initial dials. A special Overland design has been added in which the stem of the Moto-Meter screws into the Overland radiator cap. This design may be had in all three Moto-Meter models.—The Moto-Meter Co., Long Island City, N. Y.

**An Air Hose Reel**

Two new accessories especially valuable to garagemen are: An automatic hose reel for wall or post mounting comprising a drum for winding up the air hose when not in use and thus keeping it out of dirt and grease and free from kinks and other damage, and with a pressure gage attached. The reel is

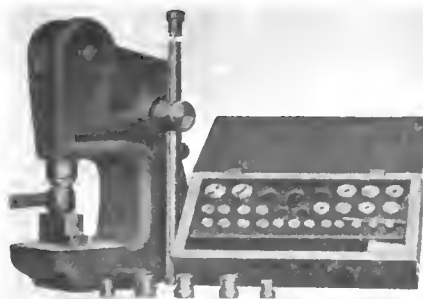


United Engine & Mfg. Co. hose reel

easily operated and cannot get out of order, automatically shutting off the air when the hose is not in use. It may also be used for hose in filling radiators, etc.; an oil service cart containing three 12 gal. tanks for light, medium and heavy oils renders supplying oil to a car easy and clean as the cart can be brought up to the car and the oil pumps out through a hose, thus obviating spilling of lubricant. These carts are also made with two tanks.—United Engine & Mfg. Co., Hanover, Pa.

**Beach Bushing Press**

Replacing bushings is rendered unnecessary when the Beach process bushing press is used. A small press and swedges



Beach process bushing press



Westinghouse charger, type WI, designed for charging small batteries

in all sizes from 7/16 to 1 3/16 in. to fit practically all standard bushings are furnished. When bushings have been swedged in place they may be again reamed to fit. Six connecting-rods may be swedged and reamed in 1/2 hr., and the metals in the bushings are finer grained than formerly owing to the swedging process. Price \$100 f.o.b. Boston.—Greb Co., Boston, Mass.

**Sager Bumper Improvements**

The Sager combined channel and diamond section bumper is fastened to the frame brackets in a new way. The arm carrying the bumper has a pointed screw which goes through the bottom flange of the channel and the point engages the upper flange. The whole is held tight by a lock nut.—J. H. Sager Co., Rochester, N. Y.

**Small Westinghouse Charger**

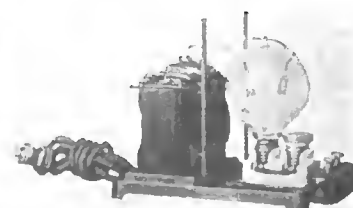
Type WI is a charger designed for charging small batteries of from one to six lead cells or up to ten Edison cells such as those used for starting, lighting and ignition. It is intended for the small garageman or the car owner. The rectifier bulb and transformer are mounted on a small cast-iron frame with a perforated sheet-iron cover. The outfit delivers a practically constant current of approximately 5 amp. throughout a complete charge to any battery within the limits of the cell range. Starting is accomplished by shaking the outfit. It is designed for 110 volts and transforms the current to 2 to 15 volts d.c. List price, \$25.—Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

**Mattson Additions**

A new heat and cold deflector for Fords, consisting of a rubber pad with a soft closing feature for the pedals, Holdfast fabric back repair outfit for repairing inner tubes and pedal pads for Cadillac, Hupmobile and Saxon cars are new features at the booth of the Mattson Rubber Co., Lodi, N. J.

**Sipp Drill Presses**

In Sipp quick-change-speed sensitive drill presses a new feature is evident at the show this year in a regulation of power feed to the spindle. A capstan wheel when pulled down by hand automatically throws on the power feed and



as soon as the drill passes through the work the mechanism automatically returns to its original position. A feature of the exhibit is a machine for drilling four-speed oil holes in crankshaft and equipped with a universal table which can be tipped to any angle, the entire outfit swinging around a column.—Sipp Machine Co., Paterson, N. J.

**Prest-O-Lite Lead Burner**

The new lead burning outfit which is designed particularly for storage battery work is of interest to repair men. It consists of an oxy-acetylene torch which is modified to give best results with this work.—Prest-O-Lite Co., Indianapolis.

**New Pratt Products**

A wire mat for running boards with spring hook attachment to make removal easy for cleaning, etc., and selling at 75 cents, is one of the new things at the Pratt exhibit. There is also a Mud Puller jack, a combination of a pulling device and an ordinary jack. Price, \$2.50. A movable step jack is also shown, enabling the operator to meet all sorts of conditions, such as rough road surfaces, flat tire, car sinking in mud,

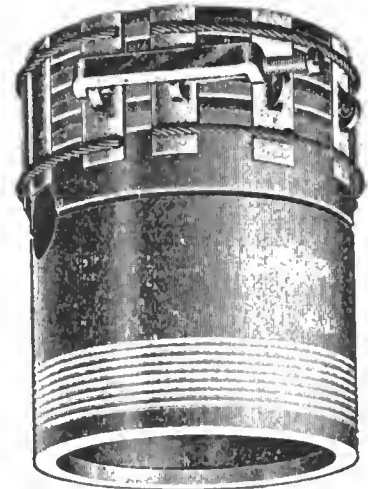
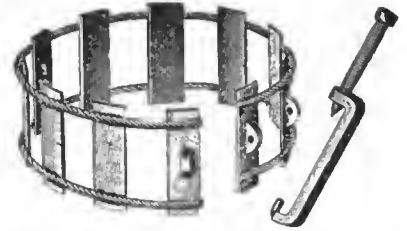
etc. Price, \$2.50. This jack is made in all sizes from 8 in. up.—William E. Pratt Mfg. Co., Chicago.

**A Ring Compressor**

Pistons may be easily inserted in the cylinder by the aid of this ring compressor. It consists of a series of steel clamps, held together by two steel cables inserted in the piston. These are placed around the rings and contracted by means of a hook and screw, which force the rings into their grooves. Price, pistons 2 to 4 in. diameter, 80 cents.—S. W. Merritt Co., New York.

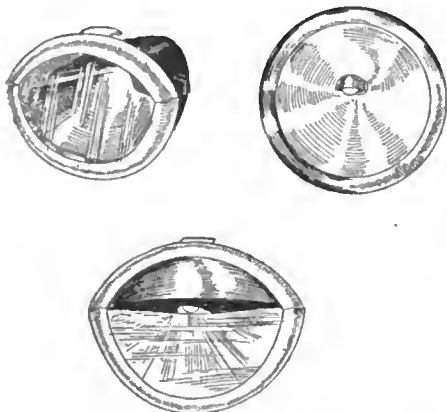
**Lightning Cleanser**

The cleanser is an oily liquid which is said to dissolve mud, oil grease and dust and may be used in place of soap and water in cleaning the car. When it dries, it forms a thin hard coat of a wax-like substance on the surface, preserving the finish from the elements, it is said. The cleanser is applied with a saturated piece of cloth, sponge or piece of waste, after which the body should be wiped dry and polished. Price, \$1.50 per 1/4 gal.—Lightning Cleanser Mfg. Co., Perin Bldg., Cincinnati, Ohio.

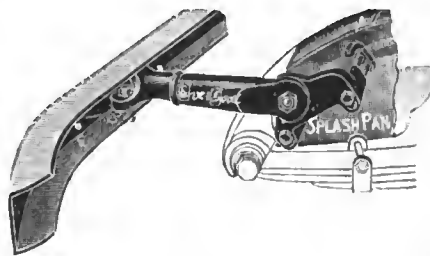


Merritt piston ring compressor

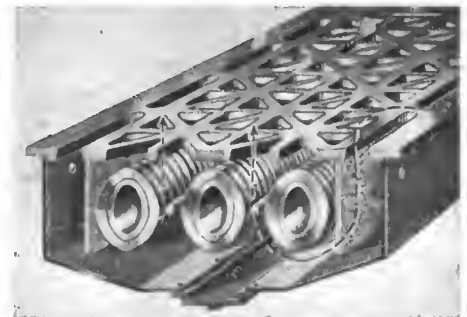
**Some Accessories at the New York Show Described Last Week, But Not Illustrated**



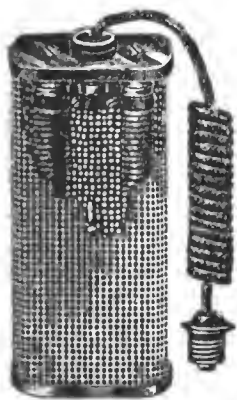
Helze headlight reflectors



Grossman EverGood splash pan channel bumper



Autocraft-Bovey heater which the driver can control from the seat



Presto electric engine anti-freeze heater



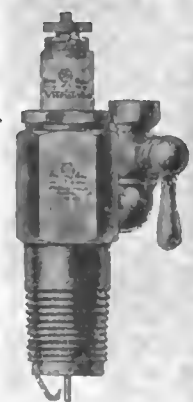
Autocraft steel ball spark plug



A-C Titan 7/8-in. racing plug



Grossman Red Head spark plugs with the new Vitri-stone insulation. Left—7/8-in. Big Boy. Center—1/2-in. standard. Right—1/2-in. priming plug



# Industrial Miscellany

## Personals

S. Christensen has been appointed as special sales representative of the Motor Products Corp., Detroit. Mr. Christensen was formerly traveling representative of the Vanguard Mfg. Co., one of the five companies now incorporated in the Motor Products Corp.

John McAvoy, formerly of the American Top Co., will associate with several Jackson, Mich., citizens and form a company for the purpose of making motor car tops and accessories. It is planned to lease the plant of the Standard Mfg. Co. at Jackson for manufacturing purposes.

W. H. Varley, who was manager of the Hudson Motor Car Co. branch at

Newark, N. J., has joined his former chief, E. C. Morse, now vice-president and general manager of the Chalmers Motor Co., Detroit, and will travel.

J. A. Bower, organizer and vice-president of the Bankers' Community Corp., Detroit, which promotes sales of automobiles, has been elected vice-president of the Liberty National Bank, New York. He retains his other interests.

Fred Hill, factory representative of the Willys-Overland Co., Toledo, has resigned to act as retail sales manager for the Paige Motor Sales Co., Seattle.

J. R. Gemrill, formerly sales manager for the Kansas City branch of the B. F. Goodrich Co., has been appointed to take charge of the Chicago branch of the Pennsylvania Rubber Co.

Roy Sheen has been appointed manager of the Portland branch of the wholesale accessory house of Hughson & Merton, succeeding E. O. Johnstone, who has resigned to become a member of the sales organization of the Weed Tire Chain Co.

Richard Taylor has been made branch manager for the Zenith Carburetor Co., Chicago. Mr. Taylor was formerly connected with the General Motors Co.

W. D. Young, who has been the Southern field representative for the Packard Motor Car Co., has been awarded the Packard agency for Birmingham, Ala.

W. D. Smith has been appointed sales manager of the California Tire & Rubber Co., 597 Golden Gate Avenue, San Francisco.

## The Automobile Calendar

### ASSOCIATIONS

Jan. 24-26 — Chicago, Second Annual Meeting National Assn. of Automobile Accessory Jobbers. Congress Hotel.

### CONTESTS

April—Los Angeles to Salt Lake City Road Race.  
 May 19—New York Metropolitan Race on Sheepshead Bay Speedway.  
 May 30—Indianapolis Speedway Race, Championship.  
 June 9—Chicago, Ill., Speedway Race, Championship.  
 June 23 — Cincinnati, Ohio, Speedway Race.  
 July 4—Omaha, Neb., Speedway Race, Championship.  
 July 4—Tacoma, Wash., Speedway Race, Championship.  
 July 14 — Des Moines, Iowa, Speedway Race, Championship.  
 Aug. 4—Kansas City Speedway Race.  
 Sept. 3—Cincinnati, Ohio, Speedway Race, Championship.  
 Sept. 15 — Providence, R. I., Speedway Race, Championship.  
 Sept. 29—New York, Speedway Race, Championship.  
 Oct. 6—Kansas City Speedway Race.  
 Oct. 13 — Chicago, Speedway Race.  
 Oct. 27—New York Speedway Race.

### SHOWS

Jan. 12-20—Philadelphia, Show, Philadelphia Automobile Trade Assn.  
 Jan. 16-20—Fall River, Mass., Show, Casino.  
 Jan. 17-19 — Milwaukee, Wis., Union Storage Bldg., King Street, Dealers' Assn.  
 Jan. 20-27 — Montreal, Que., Almy Bldg., Automobile Trade Assn.  
 Jan. 20-27—Detroit, Mich., 16th Annual Show, Detroit Automobile Dealers' Assn.  
 Jan. 22-27—Rochester, N. Y., Show, Exposition Park, Rochester Auto Trades Assn.  
 Jan. 22-27—Manchester, N. H., Academy.  
 Jan. 22-27 — Buffalo, N. Y., Show, Broadway Auditorium, Buffalo Automobile Dealers' Assn.

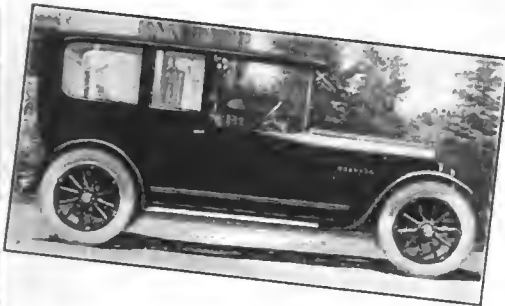
Jan. 22-27—Scranton, Pa., Board of Trade Bldg., H. B. Andrews, Mgr.  
 Jan. 23-27—New Bedford, Mass., State Armory, Stephen W. Pierce, Mgr.  
 Jan. 23-27 — Oklahoma City, Okla., Show, Auditorium.  
 Jan. 23-27 — Baltimore, Md., Show, Fifth Regiment Armory.  
 Jan. 24-27—Lewiston, Pa., First Annual.  
 Jan. 24-29—Charleston, W. Va., Armory.  
 Jan. 25-27—Asheville, N. C., Show, Asheville Automobile Trade Assn.  
 Jan. 27-Feb. 3—Richmond, Va., First Annual, Gray's Armory.  
 Jan. 27-Feb. 3—Columbus, O., Show, Memorial Hall, Columbus Dealers' Assn.  
 Jan. 27-Feb. 3, 1917—Chicago, Ill., Show, Coliseum, National Automobile Chamber of Commerce.  
 Jan. 27-Feb. 3—Portland, Ore., Eighth Annual, Dealers' Motor Car Assn. of Oregon.  
 Jan. 27-Feb. 5 — York, Pa., Show, York Automobile Dealers' Assn.  
 Jan. 28-Feb. 3 — Wilmington, Del., Show, Hotel duPont.  
 Jan. 29-30—London, Ont., Victor Carty, Mgr.  
 Feb. 3-10—Minneapolis, Minn., Show, Minneapolis Automobile Trade Assn.  
 Feb. 5-9—Boston, 8th National Good Roads Show, Mechanics' Bldg.  
 Feb. 5-10—Indianapolis, E. W. Steinhart Bldg., Indianapolis Automobile Trade Assn.  
 Feb. 5-10—Bangor, Me., Bangor Automobile Assn., Auditorium.  
 Feb. 5-10—Indianapolis, Ind., Indianapolis Automobile Trade Assn., Steinhart Bldg.  
 Feb. 7-10 — Bay City, Mich., Automobile and Accessories, Armory, F. D. Shaver, Mgr.  
 Feb. 7-11 — Kalamazoo, Mich., State Armory, Kalamazoo Automobile Dealers' Assn.  
 Feb. 8-15—First Pan-American Aeronautic Exposition, New York City; Aero Club of America, American Society of Aeronautic Engineers, Pan-American Aeronautic Federations.

Feb. 10-17 — Harrisburg, Pa., Harrisburg Automobile Dealers' Assn., J. Clyde Myton, Mgr.  
 Feb. 10-17 — Hartford, Conn., Show, State Armory, First Infantry.  
 Feb. 10-18—San Francisco, Cal., Pacific Automobile Show, G. A. Wahlgreen, Mgr.  
 Feb. 12-17 — Bay City, Mich., Show, Armory.  
 Feb. 12-17 — Louisville, Ky., Show, First Regiment Armory, Louisville Automobile Dealers' Assn.  
 Feb. 12-17—Toledo, O., V. G. Kibby, 1017 Jefferson Ave.  
 Feb. 12-19 — Indianapolis, Ind., Show, Steinhart Bldg., Indianapolis Automobile Trade Assn.  
 Feb. 13-15—Grand Forks, N. D., Auditorium, Automobile Dealers' Assn.  
 Feb. 13-17 — Williamsport, Pa., Armory, John Kelly, Mgr.  
 Feb. 14-17—Peoria, Ill., Coliseum, Automobile and Accessory Dealers' Assn.  
 Feb. 15-17—Racine, Wis., Chss. A. Myers, Mgr.  
 Feb. 17-24—Albany, N. Y., Sixth Annual, State Armory, Albany Automobile Dealers' Assn.  
 Feb. 17-24 — Newark, N. J., Show, First Regiment Armory.  
 Feb. 18-25 — St. Louis, Mo., Show, Automobile Manufacturers' and Dealers' Assn.  
 Feb. 19-24 — Springfield, Ohio, Show, Memorial Hall, Springfield Automobile Trade Assn.  
 Feb. 19 — Pittsfield, Mass., Show, Armory, J. J. Callahan, Mgr.  
 Feb. 19-24—Portland, Me., Exposition Building.  
 Feb. 19-24 — Grand Rapids, Mich., Show, Automobile Business Assn. of Grand Rapids.  
 Feb. 19-24 — Duluth, Minn., Show, Duluth Auto Dealers' Assn., Armory.  
 Feb. 19-24 — South Bethlehem, Pa., Show, Coliseum.  
 Feb. 19-24—Bridgeport, Conn., Show, Armory, Coast Artillery Corps.  
 Feb. 19-24—St. Louis, Overland Bldg., St. Louis, Auto Dealers' Assn.  
 Feb. 19-24—Syracuse, N. Y., Show, State Armory, Syracuse Dealers' Assn.

Feb. 19-24—Pittsfield, Mass., J. J. Callahan, Mgr.  
 Feb. 21-24—Flint, Mich., Coliseum, Lake Side Park, E. W. Jeffers, Mgr.  
 Feb. 24-March 3 — Brooklyn, Show, 23rd Regiment Armory.  
 Feb. 24-Msr. 3—Atlanta, Ga., Automobile Dealers' Assn., Auditorium.  
 Feb. 26-March 3—Omaha, Neb., Show, Auditorium, Omaha Automobile Show Assn.  
 Feb. 26-Mar. 3—Utica, N. Y., Utica Automobile Dealers' Assn., State Armory.  
 Feb. 26-Mar. 3—Wilkes-Barre, Pa., Hugh B. Andrews, Mgr.  
 Feb. 27-March 4—Atlanta, Ga., Show, Auditorium, Atlanta Auto Trades and Accessory Assn.  
 March 1, 2, 3 — Urbana, Ill., Show, Automobile Trade Assn. of Champaign Co., Armory of the University of Ill.  
 March 3-10 — Boston, Mass., Show, Mechanics' Bldg., Boston Automobile Dealers' Assn.  
 Mar. 3-10—Washington, D. C., Middle Atlantic Motor Assn., Inc., Union Bldg.  
 Mar. 6-9—Fargo, N. D., A. Hanson, Mgr.  
 March 6-10—Ft. Dodge, Iowa, Northern Iowa Show, New Terminal Warehouse, G. W. Tremain, Secretary.  
 March 7-10—St. Joseph, Mo., Auditorium, St. Joseph Automobile Show Assn.  
 March 13-16 — Fargo, N. D., Armory and Auditorium.  
 March 14-17—Mason City, Ia., Armory, Mason City Automobile Dealers.  
 March 14-17—Davenport, Iowa, Show, Coliseum Bldg., Tri-City Auto. Trade.  
 Mar. 14-17—Trenton, N. J., J. L. Brock, Mgr.  
 March 17-22 — New Haven, Conn., Show, Hotel Taft.  
 Mar. 17-24—Pittsburgh, Pa., Motor Square Garden, J. J. Bell, Mgr.  
 March 18-23—Cedar Rapids, Ia., Cedar Rapids Automobile Trades Assn.  
 April—Calumet, Mich., Show, Coliseum, Frank Ketchell, Mgr.  
 Apr. 4-7—Stockton, Cal., Second Annual San Joaquin Auto Trades Assn., Samuel S. Cohn, Mgr.  
 Sept. 2-9—Stokane, Wash., Interstate Fair.

# Hudson Super-Six

*Limousines    Landaulets    Landaulet-Limousines    Town Cars*



Coaches  
made  
by the

**Biddle & Smart Co., Amesbury, Mass.**

Here are true aristocrats among coaches, marked by beauty of design, fine workmanship, and elegant appointment. They are equipped with the Waltham Super-Timepiece.

The makers of the Hudson Super-Six know full well that the efficiency of a car is the sum of its construction plus its equipment. They realize that an inaccurate timepiece as a feature of equipment is worse than no timepiece at all, because it slanders the car of which it is a part.

The Hudson standard of completeness demands that the above enclosed models be equipped with an automobile clock that keeps time and has a winding indicator. The Hudson standard of quality, therefore, precludes the use of any but a Waltham Clock.

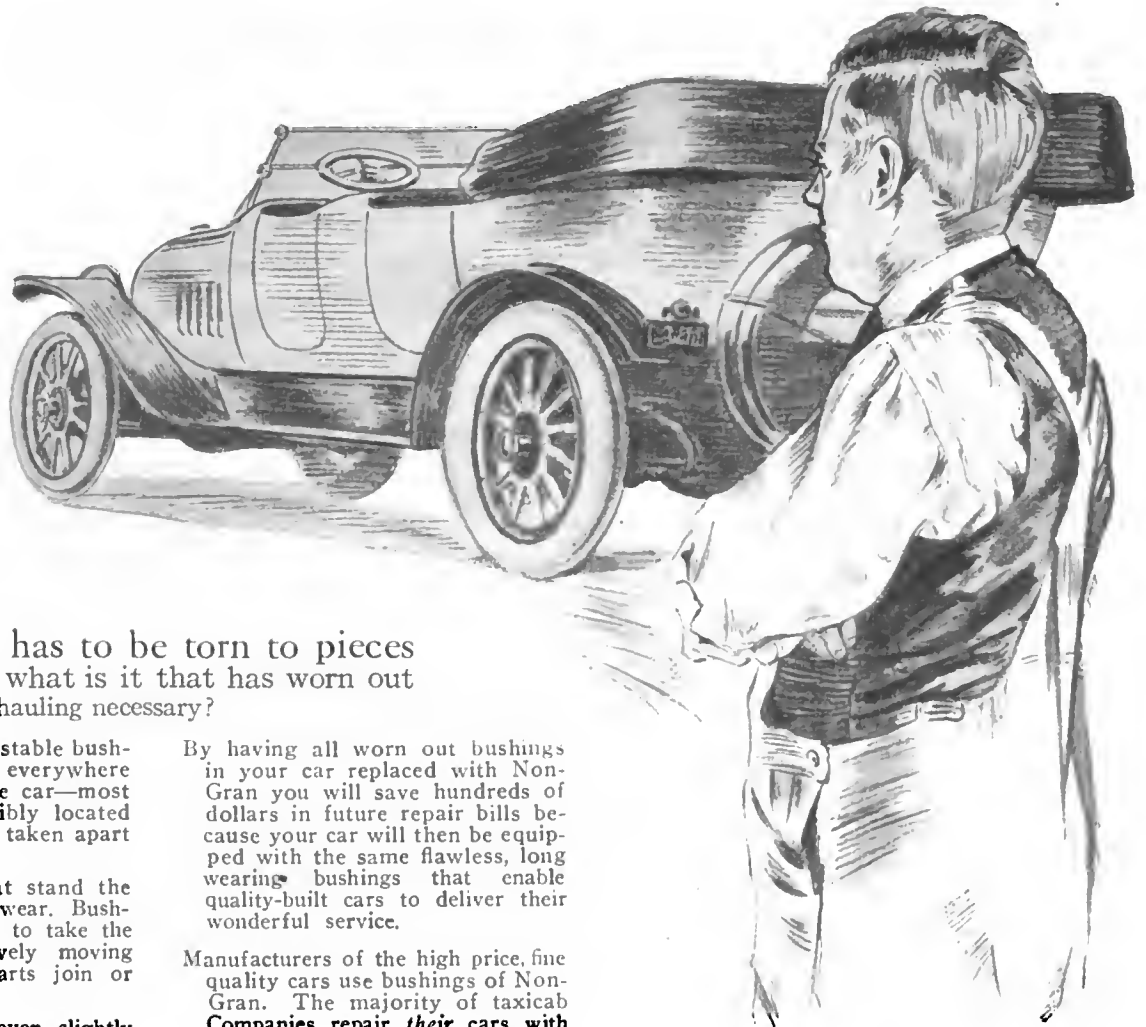
## The Waltham Automobile Clock



The Waltham is included in the regular equipment of the following makes of cars:

- |                  |               |              |
|------------------|---------------|--------------|
| Brewster         | Hudson        | Pierce-Arrow |
| Cadillac         | Locomobile    | Rauch & Lang |
| Cole             | Lozier        | Rolls-Royce  |
| Crane            | Marmon        | Simplex      |
| Detroit-Electric | Mercer        | Stearns      |
| Franklin         | Owen-Magnetic | Winton       |
| Haynes           | Packard       |              |

**WALTHAM WATCH COMPANY. WALTHAM, MASS.**



When your car has to be torn to pieces and overhauled, what is it that has worn out and made this overhauling necessary?

It is the solid, non-adjustable bushings, here, there and everywhere throughout the entire car—most of them so inaccessibly located that the car must be taken apart to get at them.

It is the bushings that stand the brunt of friction and wear. Bushings are buffers used to take the wear between relatively moving parts where these parts join or meet.

These bushings when even slightly worn cause noise and power loss and as they are not split and cannot be adjusted, they must be renewed.

In having your car overhauled, remember please that the quality of the bushings used will determine to a minute just how long your car will run without rattling and further overhauling.

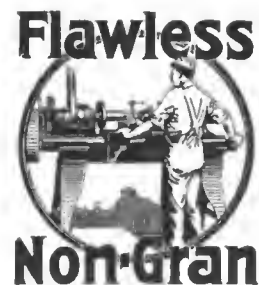
Bushings of Non-Gran Bronze cost a trifle more than ordinary bronze bushings but, considered from the viewpoint of performance and satisfaction, they are from 3 to 10 times cheaper.

By having all worn out bushings in your car replaced with Non-Gran you will save hundreds of dollars in future repair bills because your car will then be equipped with the same flawless, long wearing bushings that enable quality-built cars to deliver their wonderful service.

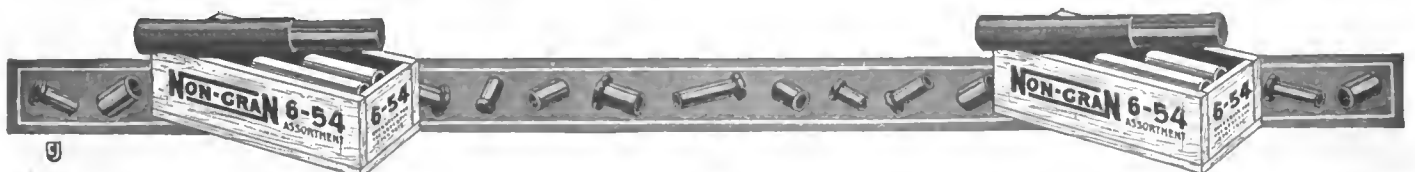
Manufacturers of the high price, fine quality cars use bushings of Non-Gran. The majority of taxicab Companies repair their cars with Non-Gran bushings. Wherever long, hard, uninterrupted service is essential, bushings of Non-Gran are invariably used.

You will have no trouble in getting Non-Gran, for every good repairman thinks enough of his work to use it. No repairman need have trouble in getting cored bars of Non-Gran from which to make these bushings, for they are immediately obtainable from any jobber in the land.

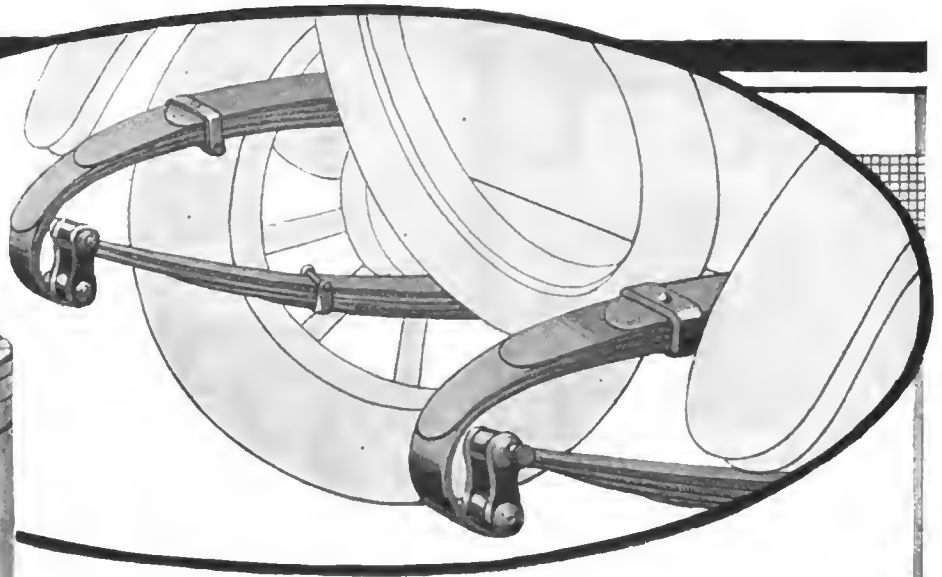
**American Bronze Company**  
Derwyn Pennsylvania



HIGH SPEED  
**NON-GRAN**  
BEARING BRONZE



Please mention The Automobile when writing to Advertisers



**I**F your springs are not properly lubricated you might as well not have any springs. With Johnson's Stop-Squeak Oil you, yourself, can keep the springs perfectly lubricated. You don't need a tool of any kind—you won't even need to jack up the car.

The springs of every car should be given an application of Johnson's Stop-Squeak Oil once a month. It penetrates between the leaves of the spring removing all rust and depositing a thin layer of grease between each leaf from end to end.

*You can easily demonstrate* the penetrating power of Johnson's Stop-Squeak Oil by applying it to the side of the springs and watching it come out on the other side, driving the rust before it and leaving a thin layer of grease between each leaf.

# JOHNSON'S STOP-SQUEAK OIL

Has the remarkable property of seeping rapidly between the spring leaves and to the furthestmost wearing points and it there becomes a heavy-bodied lubricant. It is unexcelled for removing squeaks of all kinds—in **springs, shackle bolts, body, fenders, top**, etc. Just locate the squeak and touch it with Johnson's Stop-Squeak Oil.

### *Makes Your Car Ride Easily*

Johnson's Stop-Squeak Oil is a simple remedy for hard riding cars. Instead of bumping over the road, you can fairly float along if your springs are lubricated so that you get spring action. If the leaves of a spring are rusted together you might as well have a solid piece of steel as a spring. Johnson's Stop-Squeak Oil reduces the liability of spring breakage.

If your dealer cannot supply you with Johnson's Stop-Squeak Oil, fill out the enclosed coupon and we will fill your order direct from Racine by prepaid express. Please give us the name of your dealer.

**S. C. JOHNSON & SON**  
Dept. A  
RACINE, WIS.

S. C. JOHNSON & SON, Dept. A Racine, Wis.  
Enclosed please find \$1.00 for which please send me by prepaid express a quart of Johnson's Stop-Squeak Oil.

NAME \_\_\_\_\_  
ADDRESS \_\_\_\_\_  
CITY & STATE \_\_\_\_\_  
MY DEALER IS \_\_\_\_\_



Jan  
1

**THE TIMKEN ROLLER BEARING CO.**

MAKERS OF

**TIMKEN ROLLER BEARINGS**



FACTORY AND MAIN OFFICE  
CANTON OHIO

NEW YORK OFFICE  
1790 BROADWAY

CHICAGO OFFICE  
122 S MICHIGAN AVE

ENT  
TWEAS  
RY  
RY MGR  
METALLURGIST  
R E BROCK, TIRE MILL SUPT  
P P REESE, STEEL MILL SUPT  
T V BUCKWALTER, CHIEF ENGR  
R E KAYSLETT, CASHIER  
F H HART, PURCHASING AGENT

ADDRESS ALL COMMUNICATIONS  
TO THE COMPANY NOT TO INDIVIDUALS

**CANTON, OHIO.**

*A New Year's Notice  
to Dealers of Timken-Equipped Cars*

The superior merit of Timken Roller Bearings has been made known through advertising.

The volume of Timken advertising will be very materially increased this year.

The conclusion is obvious. People will more and more prefer cars equipped with Timken Bearings and it is going to be just so much easier for dealers handling these cars to sell them.

We want to make this advertising co-operate as closely as possible with your sales efforts. We want Timken advertising to do its full share towards making it easier for you to sell more cars.

To this end we would be glad to entertain your criticisms and suggestions about Timken advertising and we would like to know how we can best make this advertising of the greatest help to each individual dealer in the country.

May we have the pleasure of hearing from YOU?

The Timken Roller Bearing Co.

*Harman Ely*  
Secretary.



All the World  
Knows & Uses

Perlman  
Demountable  
RIMS

PERLMAN RIM CORPORATION  
MANUFACTURERS

1790 BROADWAY - NEW YORK CITY

United States Rubber Co. Bldg. Broadway, at 58th St

Please mention The Automobile when Writing to Advertisers

# Chalmers \$1090

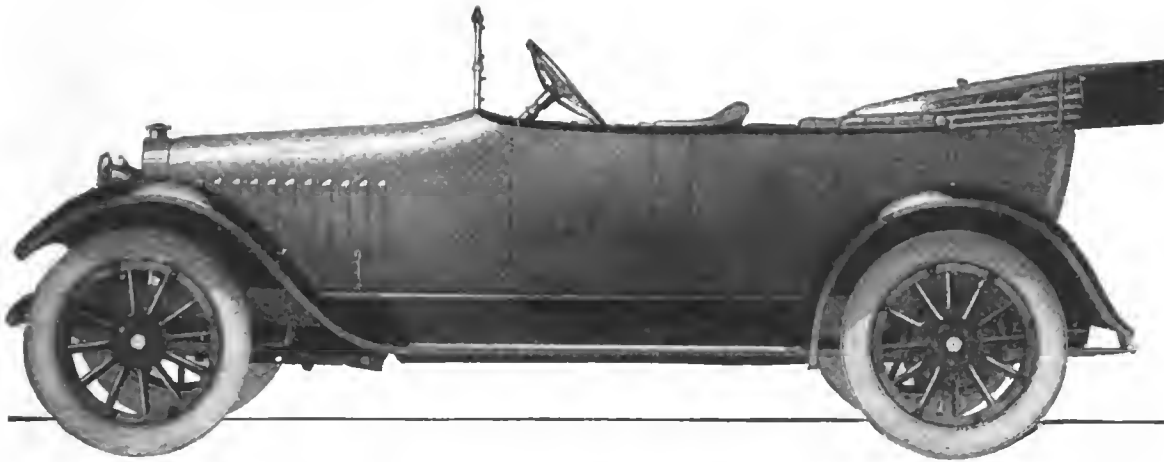
The Chalmers Car and the Chalmers proposition is very attractive this year. Especially attractive to ambitious dealers. Dealers who want to grow.

Attractive because Chalmers is a big and strong organization; building 30,000 cars for next season; aiming at even bigger things.

Attractive because the Chalmers is a popular car at a popular price.



Please mention The Automobile when writing to Advertisers



Attractive because the Chalmers can be sold possibly to the greatest advantage in the rural sections.

Attractive because Chalmers this year offers a complete line of closed cars. A line including all the popular models.

Present Prices

Five-passenger Touring	-	\$1090	Seven-passenger Sedan	-	\$1850
Seven " "	-	1350	Seven " Limousine	-	2550
Two " Roadster	-	1070	Seven " Town Car	-	2550

(All prices f.o.b. Detroit)



Please mention The Automobile when writing to Advertisers

American American

# ARE YOU GETTING AXLES —OR PROMISES



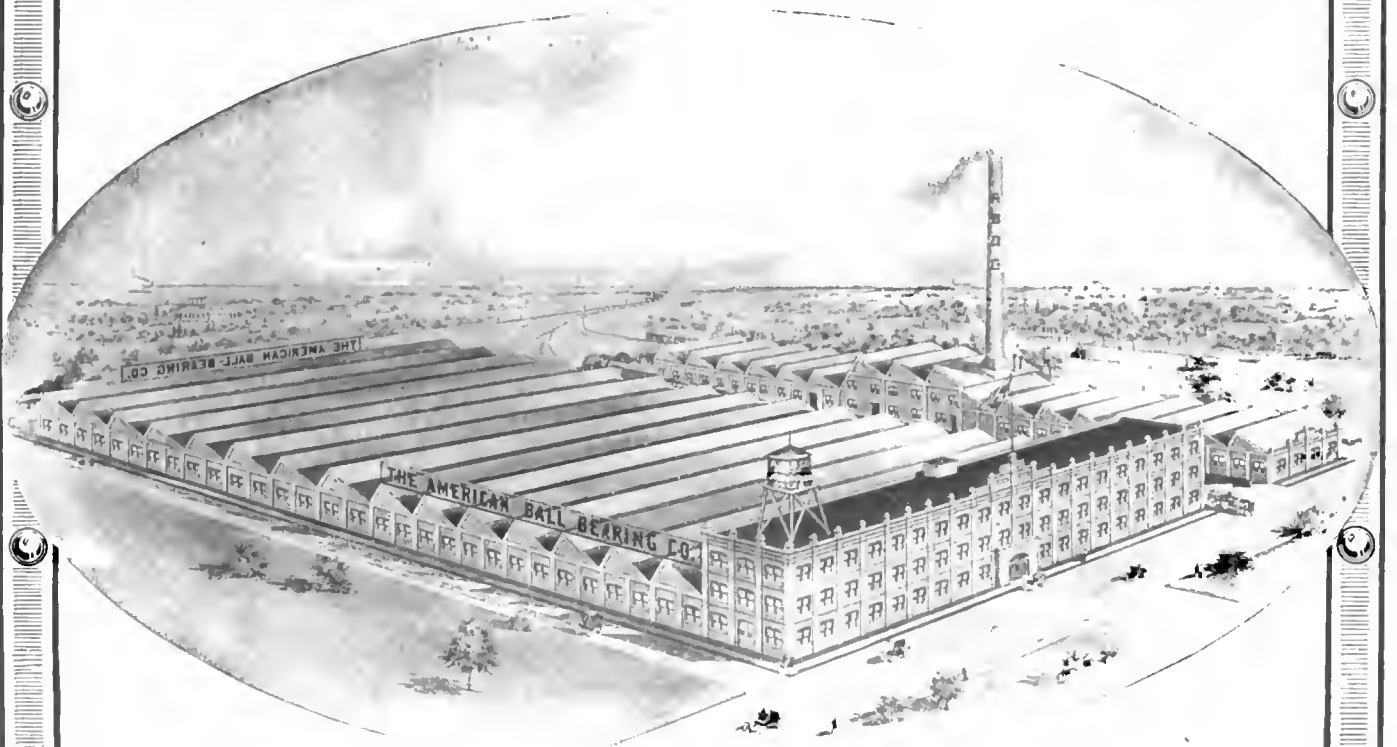
## THE AMERICAN BALL-BEARING CO.

*Licensed Under the Kardo Company Patents*

PIONEER AXLE BUILDERS OF AMERICA

CLEVELAND

OHIO



Please mention The Automobile when writing to Advertisers

## *Mechanical Accuracy*

Six separate and distinct operations are performed by the huge automatic machines used in the "ELISCO" process of tube manufacture.

Each one of these operations is gauged to a degree of mechanical accuracy that is wholly impossible where dependence is placed upon hand labor.

# ELISCO

Light Gauge, Cold Rolled

## STEEL TUBING

With our recently enlarged facilities we are still able to make reasonably prompt delivery of 18 and 20 gauge tubing in most sizes from  $\frac{3}{8}$ -inch to 2-inch outside diameter.

*Let us submit samples and quote prices.*

**The Elyria Iron & Steel Co.**  
East 131st Street - - - Cleveland, Ohio

Chicago Office  
1243 Peoples Gas Bldg.

Atlanta, Georgia Office  
Candler Bldg.

Detroit Office  
1934 Dime Bank Bldg.

*DIXIE* 20<sup>TH</sup>  
CENTURY  
MAGNETO

The Plug with the  
Green Jacket



*Lighting and Starting  
Systems*

**AMMETERS**

Conscientious manufacture and comprehensive service  
are prevailing characteristics of the Giant line of  
**SPLITDORF DEVICES.**

*If you've the motor we've the RIGHT Ignition for it*

**SPLITDORF ELECTRICAL COMPANY**  
NEWARK, NEW JERSEY



**\$100000**

*For Sensible Letters*

Next week there will be published, here, the full terms and conditions on which this sum may be won — perhaps a large slice of it by you. Only this much now: these letters will be submitted to A. A. A. officials.

(OVER)



Of course **QP** saves gas.

Everything does that nowadays.

But **QP** *does*. And then it saves power, tires, time, tempers and—sometimes—*life*.

It is nothing to patch on. It fits *in*—gets right down to the vitals of your car, reversing a hoary oversight of motor engineering.

Next week you'll know—if you don't know now.

Next week **QP** will be explained adequately—*here*.

Next week all gasoleers will know how **QP** makes a car or truck or tractor do what it ought to do.

Next week the Story of **QP**—the greatest advance in the **application of power**, since the gas engine was invented—will be public property.

If you can't wait a week, ask your neighbor. Perhaps he knows.



**When  
Super-Power  
Counts**

Deep snow—badly drifted—heavy going—  
one of the times when you ask your motor to  
give you a little better than its ordinary best.  
You'll be mighty glad at such times if you  
have an

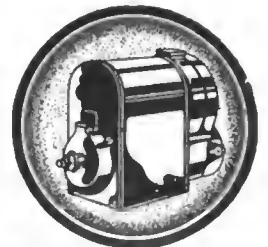
**EISEMANN**  
MAGNETO

That flashing, burning hot Eisemann spark gives  
you a full explosion every time. You can count on it  
absolutely, even though the mixture be very rich or  
very lean, whether the motor is racing or barely turn-  
ing over.

The best motor is better if you give it the Eisemann  
kind of ignition. The great ignition experts know  
this is true. That is why 108 manufacturers of  
Pleasure Cars, Trucks, Tractors, etc., have adopted  
Eisemann Magnetos as standard equipment.

**THE EISEMANN MAGNETO CO.**

Sales and General Offices:  
32-33rd St., Brooklyn, N. Y.  
Detroit, Mich., 802 Woodward Ave



Please mention The Automobile when writing to Advertisers



**DARIO RESTA**  
1917 Speedway  
Champion

# No Valve Trouble for Resta

Among the many parts and accessories that are claiming credit for Resta's victories, you as an expert know that the valve stood the most terrific grueling of all.

The valves for Resta's Peugeot have been made by The Steel Products Co., for two years past.

Valves gave more trouble to 1916 speedway racers than any other part, yet Resta says "your valves in perfect condition," "they are truly remarkable," "the best valves I ever used."

# VALVES



**Tungsten Steel**  **E. W. P. Alloy**  
**Nickel Steel** **Cast Iron Head**

The buyers of your car will probably never need a valve to stand the hundred mile an hour pace, but no matter what they demand, we can make a valve that will do the work and show the same absolute dependability that Resta's did.

We have manufactured valves of every kind for automobile service.

Consult our engineers on your valve problem.



# The Steel Products Co.

Please mention The Automobile when writing to Advertisers

31 Extra Features  
100% Over-Strength  
24% Added Luxury

**Mitchell**  
SIXES

\$1460 For 7-Passenger Six—48 h. p.  
127-inch Wheelbase.  
\$1150 For Mitchell Junior—40 h. p.  
120-inch Wheelbase Six.  
Both Prices f. o. b. Racine

# 24% Extra Luxury

In the Mitchell this season we show another result of Bate efficiency methods.

All Mitchell bodies, open and enclosed, will be built in our new body plant. This will save us on bodies some 15 per cent. Out of that saving we add 24 per cent to the cost of our finish, upholstery and trimming.

## An Exquisite Car

We have built enormous ovens, holding many Mitchell bodies. There our finish coats will be fixed by heat. This makes the Mitchell finish deep, lustrous and enduring. It should hold its gloss for years.

We have added 50 per cent to the cost of our leather. Also 50 per cent to the cost of our cushion springs to give you better upholstery. A hundred other details now show the final touch.

You will consider the Mitchell this year, we think, the handsomest car you see.

## 100% Over-Strength

This year we announce in the Mitchell double-strength in every

vital part. All important parts are oversize. Over 440 parts are made of toughened steel. All parts which get a major strain are built of Chrome-Vanadium.

One result of this over-strength is the Bate cantilever springs. These have been used for two years now, on thousands of Mitchell cars. Yet not one leaf of one spring ever has broken.

**TWO SIZES**

**Mitchell**—a roomy, 7-passenger Six, with 127-inch wheelbase. A high-speed, economical 48-horsepower motor. Disappearing extra seats and 31 extra features included.  
*Price, \$1460 f. o. b. Racine*

**Mitchell Junior**—a 5-passenger Six on similar lines with 120-inch wheelbase. A 40-horsepower motor— $\frac{1}{4}$ -inch smaller bore than larger Mitchell.  
*Price, \$1150 f. o. b. Racine*

Also all styles of enclosed and convertible bodies. Also demountable tops.

## 31 Extra Features

This year's Mitchells have 31 extra features. Most of these all other cars omit. All are paid for by our factory savings. With our over-strength and added luxury they give to the Mitchell 20 per cent extra value over any other car in this class.

## Dominant Advertising

This year we shall spend \$1,000,000 to advertise the Mitchell advantages. In magazines, weeklies, farm papers and newspapers the Mitchell will be among the two or three largest-advertised cars in America.

So all the results of Mitchell efficiency will be known to every possible buyer. To meet the demand we are going to build 25,000 cars. To appeal to a larger number of buyers we shall build the car in two sizes.

No other car in this class offers dealers an equal opportunity.

MITCHELL MOTORS COMPANY, Inc.  
Racine, Wis., U. S. A.



Please mention The Automobile when writing to Advertisers



# Spark **AC** Plug America's **C**hampion

*The Standard Spark Plug of America*



**T**HE ambition of every maker is to have his plugs selected as standard equipment on the best makes of cars.

All have an equal chance to win this honor. The manufacturers of these "Cars of Quality" only make their choice after exhaustive tests, based on actual performance. "A survival of the fittest."

AC plugs are regular equipment on the cars listed in the opposite panel—

They met the tests. Don't experiment. These leading manufacturers have done that for you. Follow a safe lead. Use the plug with AC burnt into the porcelain.

AC Spark Plugs are standard equipment on the following cars after eliminating competition.

Packard	Buick
Pierce-Arrow	Oakland
Cadillac	Oldsmobile
Marmon	Jeffery
Hudson	Daniels
Chalmers	Sandow Truck
Hupmobile	Federal
Chandler	G. M. C.
Haynes	Gramm-Bernstein
Chevrolet	Truck
Dort	KisselKar
Cole	Palmer-Moore
Reo	Murray
Paige	Bour-Davis
Peerless	Premier
Dodge Brothers	Knox
Stearns-Knight	McLaughlin
Saxon	(Canada)
Stutz	Monroe
National	Netco Truck
Velie	Moreland Truck
Jackson	Pilot
Apperson	Crane-Simplex
Davis	Singer
Detroit	Stephens
Paterson	United Truck
McFarlan	Wilcox Trux
Westcott	Jordan
Scripps-Booth	Liberty
Lexington-Howard	Signal Truck
Chase Truck	Republic Truck
Brockway Truck	Sterling Truck

CHAMPION IGNITION CO., Flint, Mich., U. S. A.

# Why have 125 Car Builders adopted the ECLIPSE-BENDIX DRIVE as Standard Equipment



- The following makes of cars are using the Eclipse-Bendix Drive as regular equipment:
- Abbott-Gerlinger
  - Detroit-Glide
  - Allen-Gbent
  - All Steel-G.M.Truck
  - Alter-Gramm-
  - American-Bernstein
  - Ames-Grant
  - Anderson-Gray-Dort
  - Apperson-G. V. Truck
  - Auburn-Hal
  - Austin-Halladay
  - Barley-Harroun
  - Biddle-Ilassler
  - Bimel-Haynes
  - Bour-Davis-Heney
  - Briscoe-Imperial.
  - Canadian-Inter-
  - Regal-national
  - Interstate
  - Case-Jackson
  - Chalmers-Jordan
  - Chandler-Kelly-
  - Chevrolet-Springfield
  - Cole-King
  - Columbia-Kissel
  - Commonwealth-Kline
  - Crawford-Lenox
  - Crow-Lescina
  - Elkhart-Lexington
  - Cummings-Liberty
  - Daniels-Lipper-
  - Davis-Stewart
  - Demno-Little Giant
  - Detroit-Lozier Bros
  - Dixie-Madison
  - Dorris-Marion-
  - Dort-Handley
  - Drummond-McFarlan
  - Duplex-Meteor
  - Eicar-M. H. C.
  - Elgin Six-Mitchell
  - Emerson-Moline-
  - Empire-Knight
  - Enger-MolinePlow
  - Erie-Monarch
  - Federal-Monitor
  - Fostoria-Monroe
  - Geneva

- Because the starting efficiency is much greater than with any other system.
  - Because the meshing of the gears is absolutely automatic. At the time of starting, the Drive gear automatically screws along the Drive shaft and meshes with the flywheel gear, and then cranks.
  - Because the demesbing after starting is absolutely automatic. After the engine is started the flywheel gear turns faster than the Drive gear and screws the latter back on the Drive shaft until it is out of mesh.
  - Because cast iron teeth without any chamfer not only make a great saving in cost, but are actually superior, being the simplest, most efficient and durable construction possible. The teeth are cut in the flywheel which is a natural gear blank. Stripping of these teeth by accidental starting when the engine is running is impossible, because of the automatic demeshing action.
  - Because back-fires are automatically protected by the shock absorbing spring Drive.
  - Because there is no over-running clutch to stick or slip.
  - Because there is no resistance or two-point switch to burn out.
  - Because there are no shifting levers and pedals, with their complications.
  - Because it is simpler and has fewer parts than any other starting system.
  - Because it eliminates chains, which stretch, break and get noisy.
  - Because it minimizes gear noise in cranking by driving through a spring.
  - Because it is absolutely silent when the engine is running, being absolutely disconnected.
  - Because it permits of using a simple, small generator for constant running.
  - Because it permits of cranking the engine with the most efficient of all starters—a separate electric starting motor—and also more evenly.
  - Because it makes the two-unit type of starting and lighting system superior to any other and the most popular of all.
  - Because it requires the minimum of care and attention during the life of car.
  - Because it is regularly supplied and used as standard equipment with the following starting and lighting systems, on over 125 different makes of motor cars; and also on a large number of marine and aeroplane motors.
- |                |                |                 |
|----------------|----------------|-----------------|
| A-B-C          | Gray & Davis   | Robbins & Myers |
| Allis-Chalmers | John O. Heinze | Roth Bros.      |
| Auto-Lite      | Kemco          | Solitdorf.      |
| Delco          | Leccc-Neville  | Wagner          |
| Detroit        | North East     | Ward-Leonard    |
| Disco          | North Western  | Westinghouse    |
| Dyneto         | Remy           |                 |

- The following makes of cars are using the Eclipse-Bendix Drive as regular equipment:
- |            |            |
|------------|------------|
| Moon       | Ross       |
| Murray     | Russell    |
| Mutual     | Saxon      |
| Napoleon   | Scripps-   |
| National   | Booth      |
| Nelson     | Service    |
| LeMoon     | S. G. V.   |
| Northway   | Singer     |
| Nusco      | South Bend |
| Oakland    | S & S      |
| Ogren      | Stearns    |
| Oldsmobile | States     |
| Overland   | Standard   |
| Owen       | Stegeman   |
| Schoeneck  | Stephens   |
| Paige      | Sterling   |
| Partin     | Stewart    |
| Palmer     | Sun        |
| Paterson   | Thomas     |
| Pathfinder | Touraine   |
| Peerless   | Trumbull   |
| Pennsy     | Union      |
| Pilliod    | U. S.      |
| Pilot      | Velie      |
| Premier    | Vulcan     |
| Princess   | Wealthy-   |
| Pullman    | Heights    |
| Regal      | Westcott   |
| Remington  | Willys-    |
| Republic   | Knigt      |
| Roamer     | Winton     |
| Rockhill   | Wolverine  |

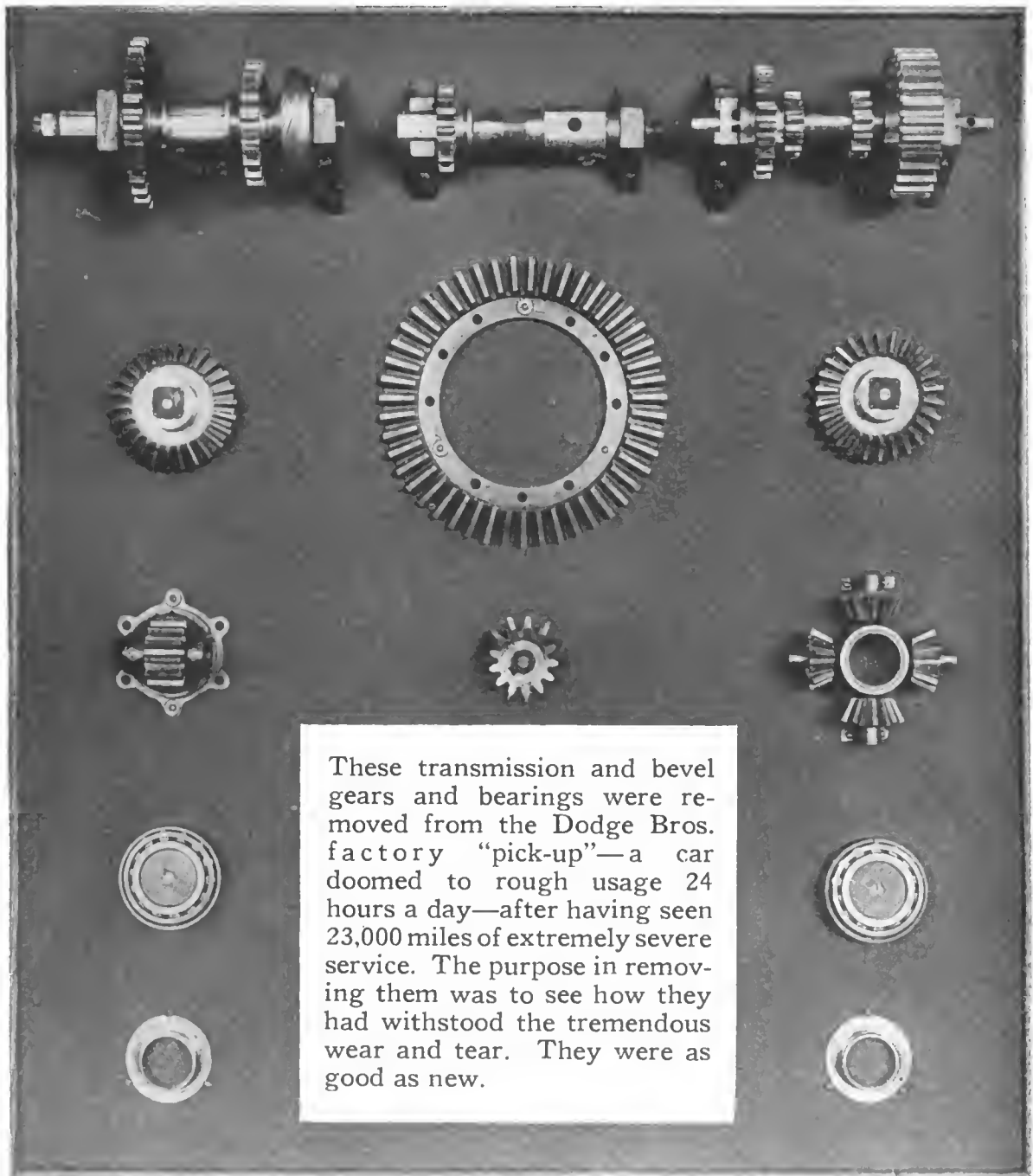
ECLIPSE MACHINE CO., ELMIRA, N. Y.

Sales Agents: BRANDENBURG & CO., NEW YORK, 57th and Broadway; DETROIT, Dime Bank Building; CHICAGO, 1112 Michigan Avenue

Please mention The Automobile when writing to Advertisers

# VANADIUM GEARS

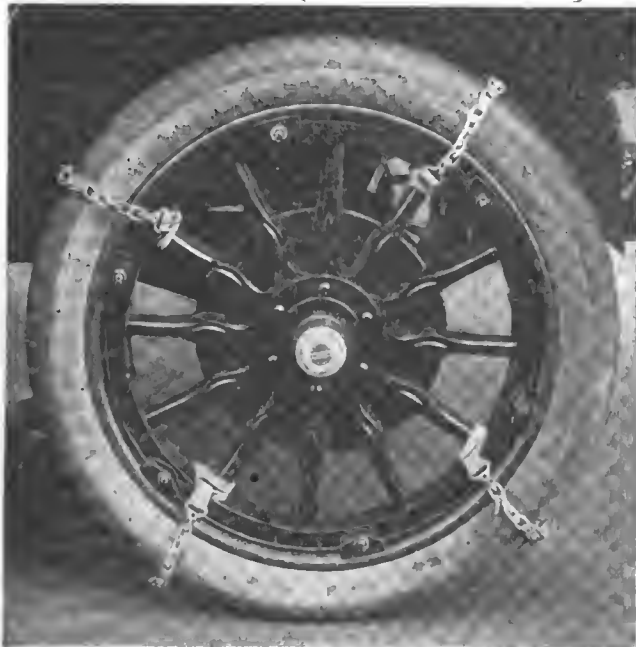
## GOOD AS NEW AFTER 23,000 MILES



These transmission and bevel gears and bearings were removed from the Dodge Bros. factory "pick-up"—a car doomed to rough usage 24 hours a day—after having seen 23,000 miles of extremely severe service. The purpose in removing them was to see how they had withstood the tremendous wear and tear. They were as good as new.

**American Vanadium Company**  
New York                      Pittsburgh                      London

Please mention The Automobile when writing to Advertisers



# Easyon Chains

"ON OR OFF IN A MOMENT"

**They are different from the ordinary chains**

*Grip like a mud hook  
Ride like a bare tire*

**TRUCK CHAINS**

Small sizes fit tires no larger than 3 in. Set of 8 .....\$4.00  
 For 3 in. or 5 in. tires. Set of 8..... 6.00  
 For 5 to 7 in. tires. Set of 8 ..... 8.00  
 Small dual chains for tires, smaller than 4 in. Each \$1.25. Set of 8.....10.00  
 Large dual chains for tires larger than 4 in. Each \$1.50. Set of 8.....12.00

**THIS DEMONSTRATION DISPLAY**

set up in a Dealer's window or on his counter sells these chains fast. It is doing this for lots of dealers now. Why not you?  
**Write for one!**



**T**HEY are used wherever ordinary chains are used. **BUT**, they can be put on in a moment, even though mired on a muddy road.

They give perfect traction.

Specially built to prevent harming the tire surface, they are light, easy to carry, and easy to attach.

Cheap to buy, smooth-running with no "bump" or drag to them, these chains are never any trouble to a motorist, and come as a perfect godsend in an emergency.

They will take you up a slippery hill or pull you out of a mudhole.

They can be attached **after** you are in trouble, frequently saving serious inconvenience if not disaster.

No motorist who has once had occasion to use them ever travels without them. They are the "stitch in time" on winter roadways.

Put on without jacking or rolling the wheel, strongly and carefully made, these chains last long and serve well. No car is completely equipped without them.

As long as you have a set of Easyon Chains in your car you can be sure you will not get stuck for want of traction. If they save you from getting stuck even once they will be worth more than their cost.

**PACKED 8 IN A BAG—4 FOR EACH WHEEL  
 Made in three sizes**

Small—Fit 3 or 3 1/4-inch tire, price.....\$3.00 Per Set  
 Medium—Fit 4 or 4 1/4-inch tire, price..... 4.00 Per Set  
 Large—Fit 5 or 5 1/4-inch tire, price..... 5.00 Per Set  
 Shipped anywhere and if not satisfactory and as represented, we will gladly refund purchase price

**Woodworth Manufacturing Corporation**  
 NIAGARA FALLS, NEW YORK  
 Canadian Factory, Niagara Falls, Ontario



# THE NATIONAL AUTO SHOW



Under Auspices of National Automobile  
Chamber of Commerce, Inc.

At CHICAGO

**Coliseum**  
and  
**1st Regiment Armory**

January 27 to February 3

***Passenger Vehicles—Parts  
Accessories***

S. A. MILES, Manager

Auditorium Hotel, Chicago

The Usual Courtesies to Visiting Dealers

Please mention The Automobile when writing to Advertisers

# CHICAGO SHOW ISSUE

OF

# THE AUTOMOBILE

Out  
January 25

Last Forms Close  
January 22

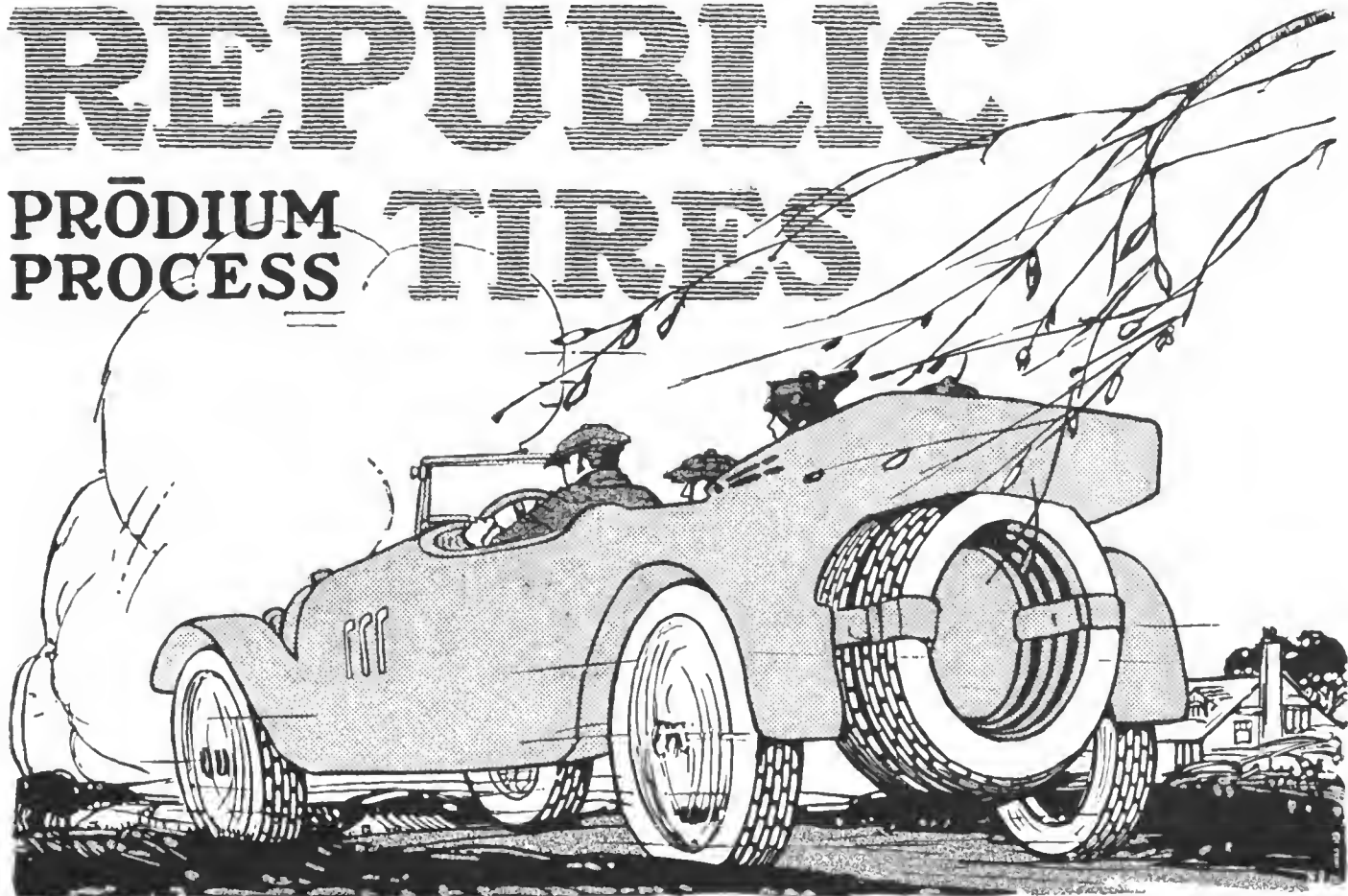
This big issue will be filled from cover to cover with a wealth of vital engineering and industrial information that will make it of highest value to a big army of readers who have come to look upon The Automobile as the industry's most authoritative spokesman.

*We urge the immediate sending of copy*

**AUTOMOBILE**

239 West 39th St., New York City

# REPUBLIC PRŌDIUM PROCESS TIRES



## THROUGH EXPERIMENTING

### A Republic Tire on Every Wheel

When you see a Republic Tire, you will usually find at least three others, or if there are other makes they are old ones.

After a man tries out a Republic his new tires thereafter will almost invariably be Republics. That motorist has sailed thru the stormy sea of doubt and anchored safe in the harbor of decision.

There's no question in his mind now. When you ask him which are the best tires he will say without hesitation, "Republics, of course."

He may change cars. There are many types and many prices of cars and what is best for him today may not be tomorrow. But for him there's only one tire for every car.

Ask any man who uses Republic Tires. Ask him why he is so positive.

## REPUBLIC TIRES

and Republic Black-Line Red Inner Tubes are made with a purpose. Back of every Republic Tire is an ideal manufacture that has never wavered.

### PRODIUM PROCESS

rubber that gives Republic Tires their toughness, resiliency, safety and road defiance, and reflects the character of Republic methods, is but one of the many exclusive reasons for Republic supremacy.

One tire sells three more. That's why progressive dealers everywhere are turning to Republics.

## THE REPUBLIC RUBBER COMPANY

YOUNGSTOWN, OHIO

*Branches and Agents in All Principal Cities*

MADE IN THE FAMOUS STAGGARD AND PLAIN TREADS

TRADE MARK REGISTERED  
U. S. PATENT OFFICE



Please mention The Automobile when writing to Advertisers

See us at the  
Chicago Show

Coliseum  
Basement

Space 18-A

# POVASCO STEERING WHEELS

## COMFORT, BEAUTY and UTILITY

**P**OVASCO WHEELS give beauty and distinction to any car. They provide also comfort and economy. Their basic construction of Condensite or Bakelite insures permanent durability and permits the maintenance of a brilliant finish on the wheel. It makes them also indestructible.

The tilting feature, (forward or back, up or down) makes them an accessory that is in the class of a necessity—it takes the cramping out of the driver's position. And the hand-warming feature procures comfortable driving all Winter and during the beautiful but cool nights of Spring and Fall.

*Povasco Wheels present a wonderful opportunity for a distributor who is a merchant. It needs only small capital—every sale carries a solid profit. Live men should write for our proposition at once.*

**Pouvailsmith  
Corporation**  
Poughkeepsie,  
New York



Please mention The Automobile when writing to Advertisers



## A Waving Signal Compels Attention

Here's an automatic device that gives you the same protection against rear-end collisions that a flagman behind would give you, waving a red flag by day or a red lantern at night. It is the

**NAFRA** Warning Signal

A simple little device that is mounted behind your license plate and connected to your foot brake lever. Every time you put on the brakes—to slow down or turn or stop—up flashes the Nafra, a waving red disk by day, a waving red light by night. The man behind can't miss it. And you can't forget it—for the Nafra flashes its signal when the brake goes on, without thought on your part. The action is positive and automatic—the mechanism simple and durable. Any garage can attach it to your car, in a short time.

**Put a NAFRA on Your Car—and Be Safe**

Dealers: Get in line to meet the demand for Nafra. The market is unlimited. Write for prices and discounts.

**THE NAFRA COMPANY, INC.**  
120 BROADWAY, NEW YORK



The Home of—  
New York, N. Y.



Leather Cloth of Quality  
Detroit, Mich.

Please mention The Automobile when writing to Advertisers

A Car Whose Performance Lives Up To Its Appearance

## MONROE

"The Car that Convinces"

The Monroe car is equipped for maximum service without any extravagance. It is conservatively built. Those essentials which have proved themselves necessary for the highest efficiency have all been incorporated in the Monroe car.

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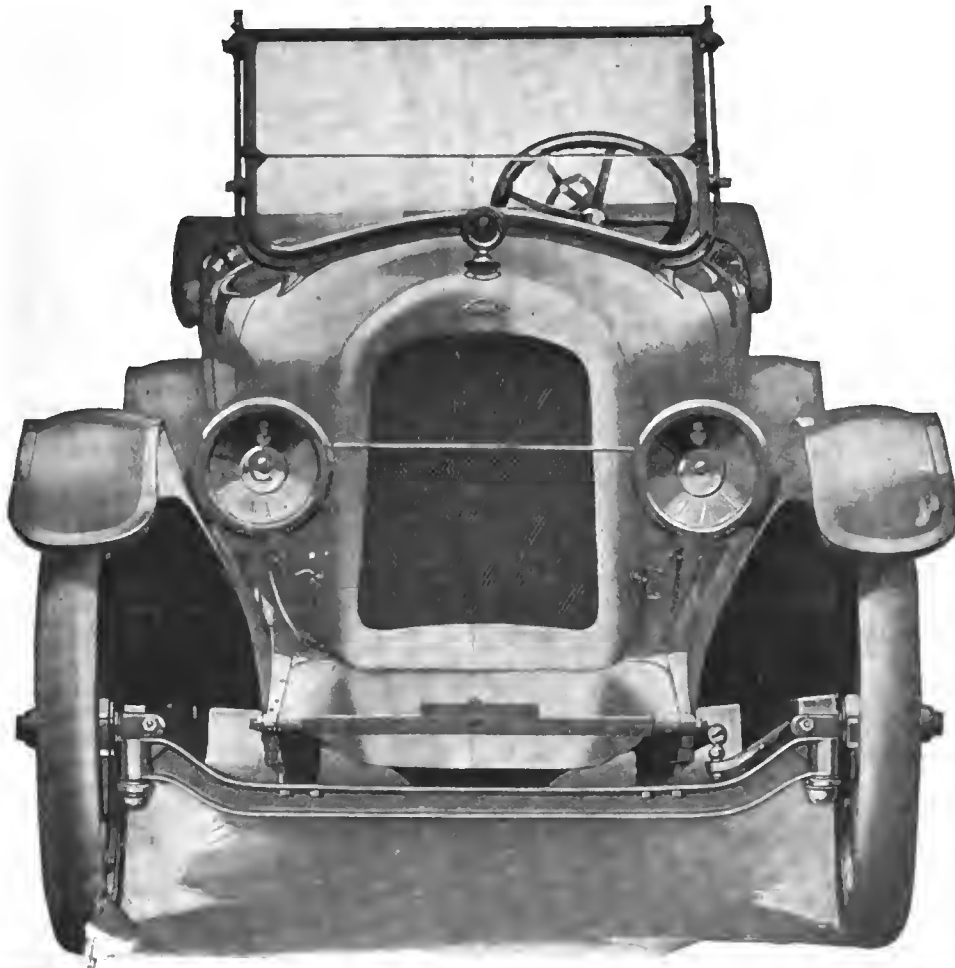
We know that there is a large market for a car such as the Monroe. The question is to get in touch with those dealers who can present the Monroe quality proposition in the right way to the thinking class of buyers.

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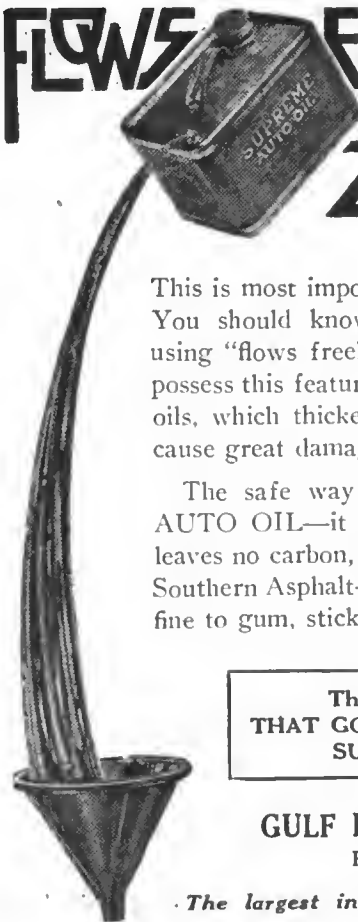
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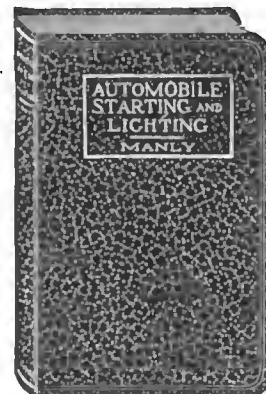
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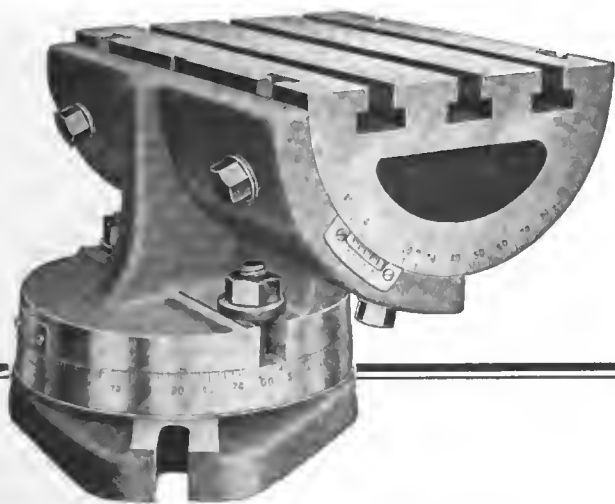
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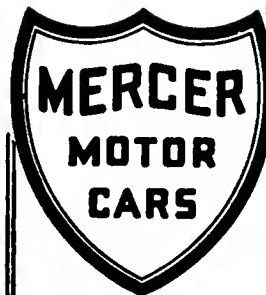
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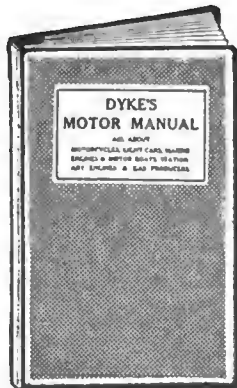
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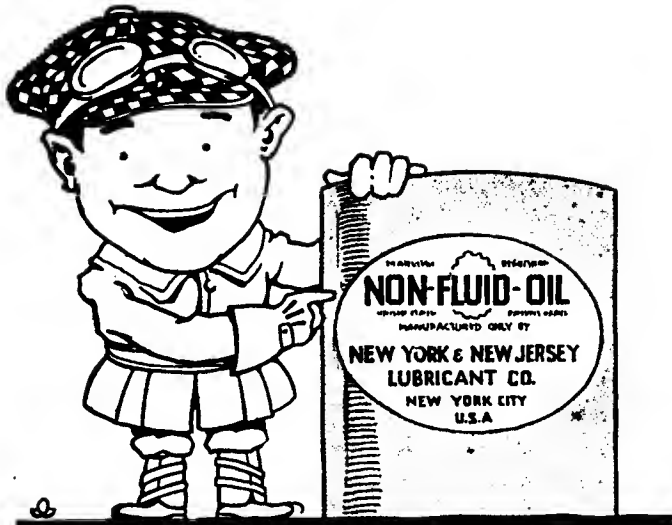
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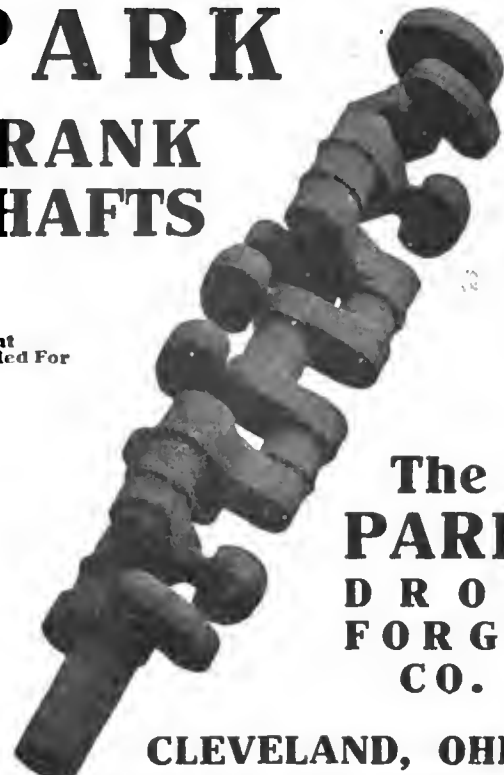


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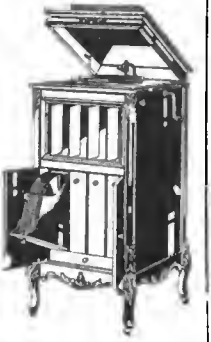


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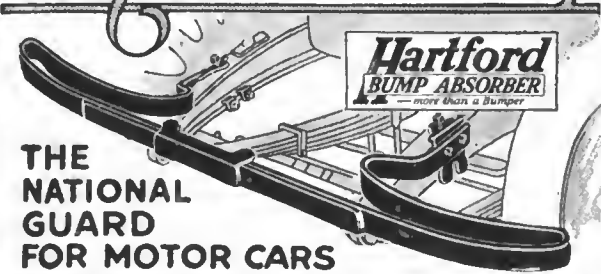
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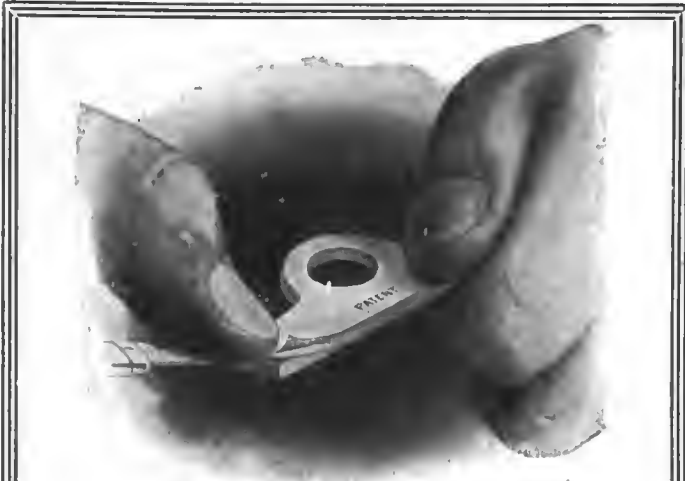


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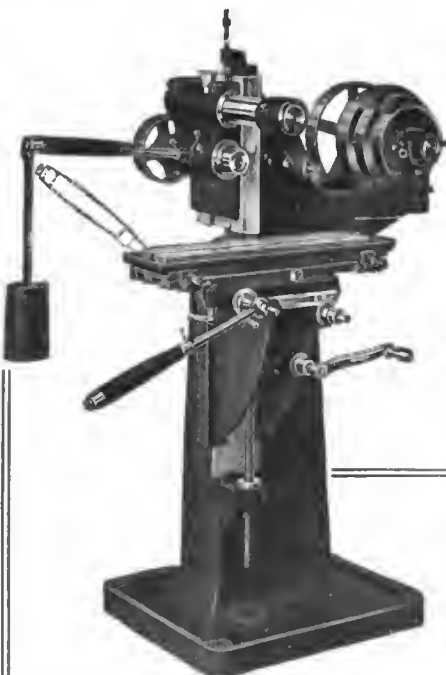
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Chains, Keys, Hand Milling Machines

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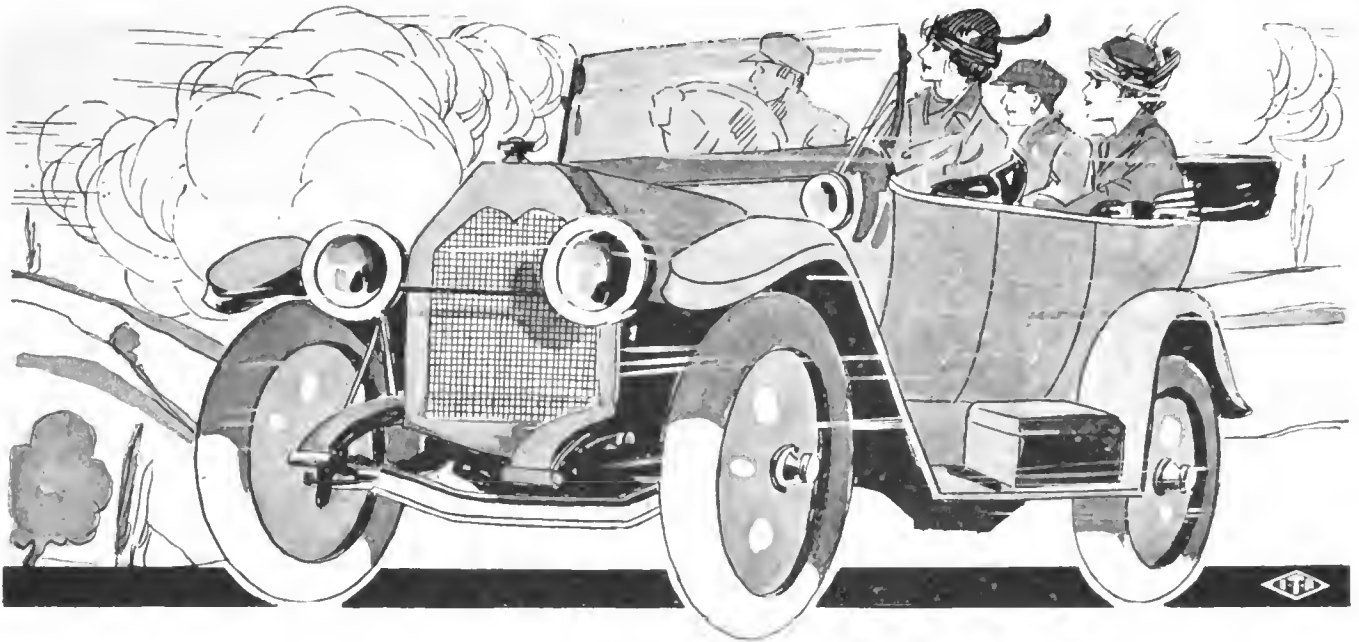
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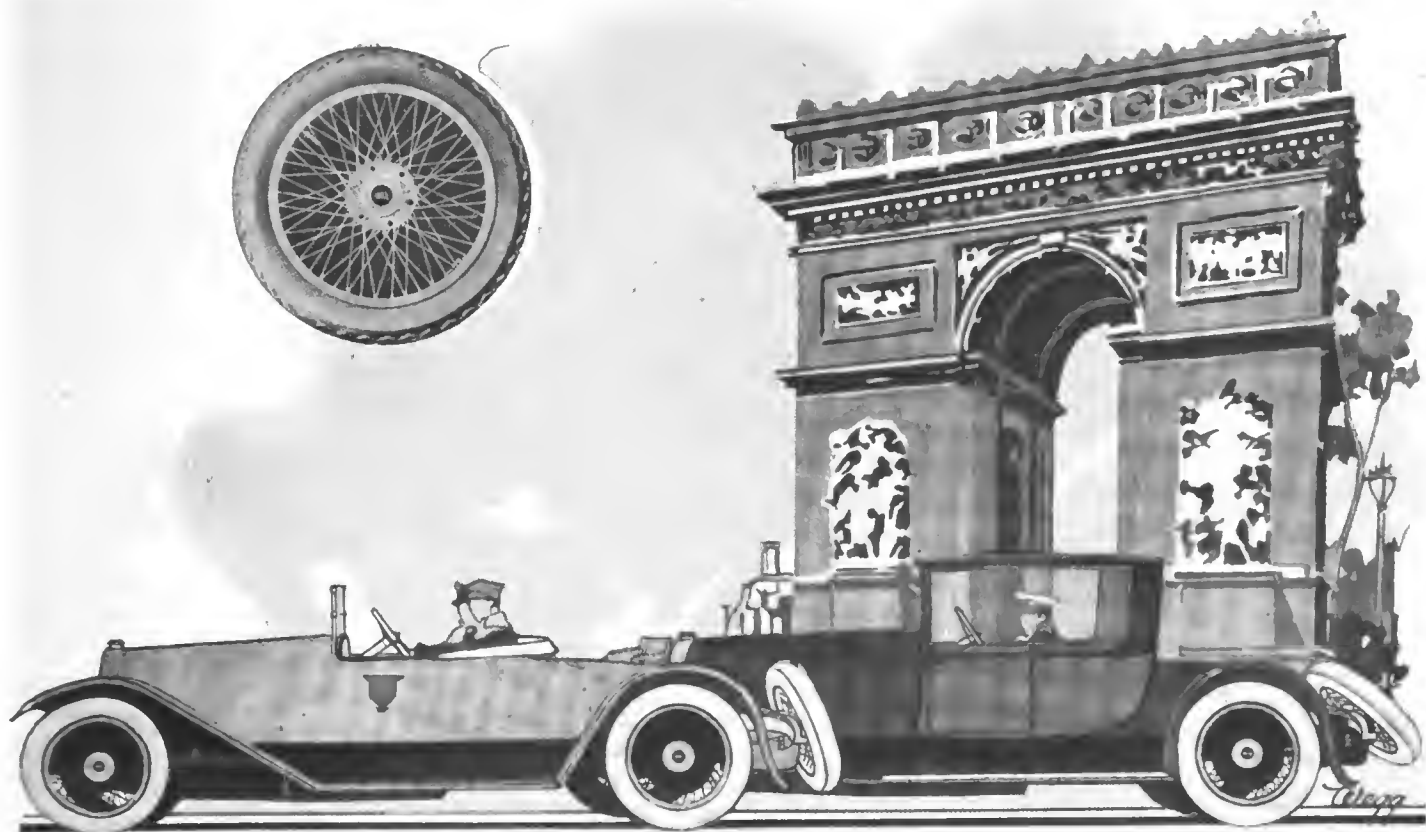
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B

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Maud L'Anphere Crook  
Stanford University, Cal.

Vol. XXXVI  
No. 4

NEW YORK, JANUARY 25, 1917

Twenty-five cents a copy  
Three dollars a year

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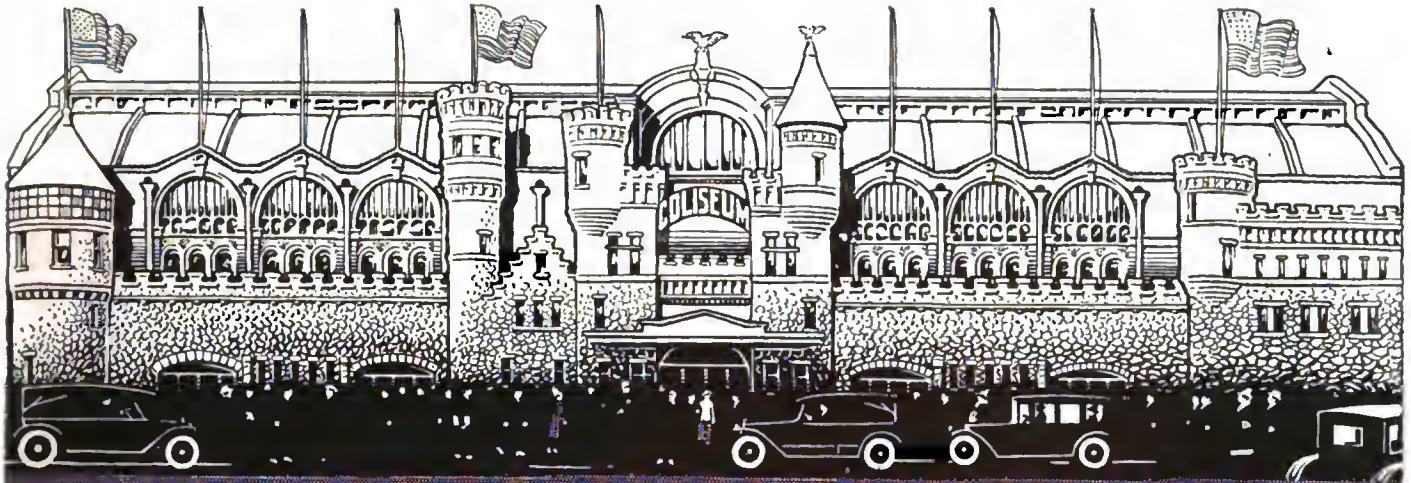
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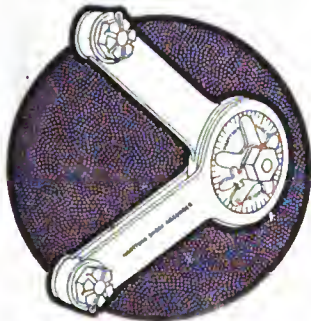
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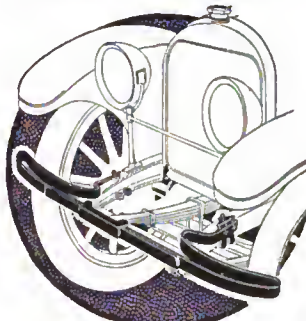


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"Makes Every Road a Boulevard"

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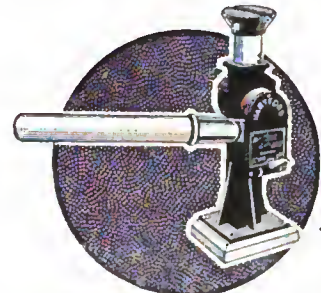


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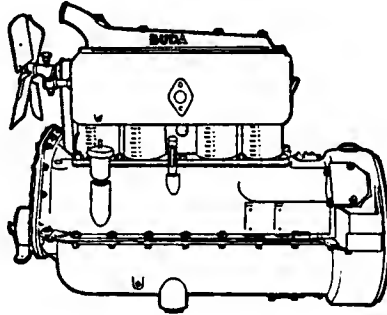
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THE BUDA COMPANY, HARVEY, (Chicago Suburb) ILLINOIS



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 THE CLASS JOURNAL COMPANY  
 231-241 W. 39th STREET NEW YORK CITY  
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**ST. LOUIS, MO.**  
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**PITTSBURGH, PA.**

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South Bend, Ind.

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# The AUTOMOBILE

VOL. XXXVI

NEW YORK—THURSDAY, JANUARY 25, 1917—CHICAGO

No. 4

## Setting the Stage at Chicago

### Three Shifts of Workers Busy Building Medieval Castle in Coliseum for Show

CHICAGO, Jan. 23—Preparation of the Coliseum and its adjacent buildings for housing the seventeenth annual car exhibition which opens Saturday presents a more serious problem to manager S. A. Miles and his associates than it has in recent years. The great Allied Bazaar which has been in progress in the mammoth structure, closed last Saturday night and almost before it came to an end workmen invaded the building and started on their work of devastation of the booths and special decorations for the charity function. They have been working continuously in 8-hr. shifts in the transformation of the Coliseum from a street of all nations into an ancient English castle.

Ninety-six automobile manufacturers will exhibit their products. This is larger than the number at New York 2 weeks ago. There will be 165 exhibitors of accessories, making a total of 261 distinct displays.

The Chicago exhibition always is looked upon as more of a business show than is the New York exhibition and it is anticipated that the coming show will surpass former records. Dealers are flocking to the city, hotels are full and show business already is under way. Texas dealers are on their way here in a special train. Four thousand dealers are expected and ticket arrangements for them are the same as they were at the New York exhibition.

The scheme of decoration will be a union of medieval and early English renaissance; and the somber massiveness of the foundation gives an impressive effect. The scenic setting has been designed at a cost variously estimated between \$30,000 and \$50,000.

Aside from the main attraction at the Coliseum and its three supplementary structures, there will be a number of special displays in place of or in addition to the master exhibit. The Chicago Salon will appear for the second time in the Elizabethan room of the Congress, opening Monday, Jan. 29 and running for the week.

### Standard Parts Negotiating for Purchase of Western Spring Co.

CLEVELAND, Jan. 23—Negotiations are on for the purchase of the Western Spring & Axle Co. by the Standard Parts Co., recently formed by the consolidation of the Perfection Spring Co. and the Standard Welding Co. The large magnitude of this combination is manifested in the fact that the Western Spring company owns four plants in Michigan and Ohio, including properties such as the Armstrong plant in Flint, the Hess-Pontiac and Cleveland-Canton Spring plants in Canton, and the Hess Spring & Axle Co., Carthage, Ohio.

Christian Girl, president of the Standard Parts Co., states that the deal is still entirely uncertain.

### United Motors Buys Radiator Damper

DETROIT, Jan. 24—The damper used on the Hudson and Columbia cars and owned by the Detroit Motor Appliance Co. has been sold conditionally to the United Motors Co. pending an investigation of the patents. The device is made by the Harrison Radiator Co. through a patent license granted to the Hudson company by the owner. The sale stipulates that the Detroit Motor Appliance Co. may continue to manufacture a damper for use on Ford cars. A subsidiary company will be formed for this purpose.

### Hastings Vice-President of Hupp

DETROIT, Jan. 22—C. D. Hastings has been made vice-president and general manager of the Hupp Motor Car Corp. Except for the 2 years 1915 and 1916, he has been with the company since its beginning.

## Hall Lamp Co. Buys Badger Brass

### Plant Sold for \$400,000—Yule Retires—\$2,000,000 Business for 1917

DETROIT, Jan. 22—The purchase of the Badger Brass Mfg. Co., Kenosha, Wis., by the C. M. Hall Lamp Co., Detroit, was completed on Jan. 20, the Badger plant being sold to the Hall company for approximately \$400,000.

The transaction was handled by J. F. Hartz, president of the purchasing company and William F. Anklam, secretary and general manager. The business will be carried on from the central offices at Detroit, Mr. Anklam handling both plants as the general manager and G. A. Mahler working as the manager of the Kenosha factory.

### Expect \$2,000,000 Business

The consolidation makes the Hall company the largest producer of its kind. Business for the next year for both plants, it is estimated will total more than \$2,000,000.

G. A. Yule, president, R. H. Wells, treasurer and C. G. Koch, vice-president of the Badger company retired from that concern on Jan. 20, immediately following its sale.

### Badger Name to Be Continued

The Badger Brass Mfg. Co. was organized in 1896 and had a capital stock of \$200,000. The name of the firm will be perpetuated by its purchasers. The C. M. Hall Lamp Co. was founded in 1908 and has a capital stock of \$750,000. Its officers are J. F. Hartz, president, F. T. Buchanan, vice-president, J. L. McDonnell, treasurer, and G. M. Anklam, secretary and general manager. Mr. Anklam, who was active in the purchase, was connected with the Badger company for 10 years prior to his coming to Detroit to form the Hall concern.

## Hand Horn Patents in Suit

Piel, Owner of Long Patent, Charges Aufiero Patent Interferes—Claims Priority

NEW YORK, Jan. 20—Gottfried Piel of the G. Piel Co., Long Island City, and owner of the Long hand horn patent, has brought suit against Emanuel Aufiero, charging that patent No. 1,207,834, granted to Aufiero, interferes with the Long patent, which it is claimed has the right of priority.

The suit is one of the unusual types known as interfering patent suits, such a suit being possible only when the patent office has issued two patents claiming the same invention.

### To Bring Countersuit

The Aufiero interests state that a countersuit will be brought very soon.

Patent No. 1,090,080, owned by Mr. Piel, was granted March 10, 1914, to George F. Long, the inventor, on an application filed Sept. 30, 1910, and was assigned to Mr. Piel. Mr. Aufiero's patent, No. 1,207,834, was granted Dec. 12, 1916, on an application filed Feb. 20, 1913, as a division of an application filed May 31, 1912. The bill of complaint in the suit lays particular emphasis on claims 7, 8, 9 and 10 of the Long patent and alleges that the Aufiero patent contains as claims 1, 2, 3 and 4 claims in the identical language of 7, 8, 9 and 10 of the Long patent. The Aufiero patent is also alleged to contain other claims which conflict and interfere with the claims of the Long patent.

The complaint declares that Mr. Long conceived and put in practice the invention of his patent and particularly the features covered in claims 7, 8, 9 and 10 long prior to Sept. 30, 1910, the date of application for the patent. It is also stated that horns embodying the invention were put into use by him and his associates before May 31, 1910, and alleges that claims 1, 2, 3 and 4 of the Aufiero patent are void, as the invention they describe was in public use for more than 2 years prior to the date when Aufiero filed the original application of which the application which resulted in the granting of patent No. 1,207,834, "purports to be a division." Long horns were sold by Long and his associates early in the spring of 1911, the bill of complaint states, and it alleges that Aufiero obtained his patent No. 1,207,834 by fraudulent means in that he knew he was not the original inventor of the invention specified in his patent.

Mr. Piel asks for the establishment of title to the invention, the issuance of a preliminary injunction restraining Mr.

Aufiero and his associates from assigning right, title or interest in patent No. 1,207,834 without leave of the court, and also for a decree adjudging the Aufiero patent, and particularly claims 1, 2, 3 and 4 thereof, void and directing the proper authorities to cancel the patent and to make the proper entries as to the cancellation thereof in the records of the United States patent office.

### Long Claims Involved

Claims 7, 8, 9 and 10 of the Long patent are as follows:

7—In a device of the character described, a diaphragm, energy transmitting means, and energy receiving, storing and imparting means adapted to receive energy from the transmitting means, said second means being always free immediately to transmit said energy to the diaphragm.

8—In an alarm or signalling apparatus, a diaphragm, a wear piece carried by said diaphragm, a rotor adapted to actuate said wear piece to vibrate the diaphragm, said rotor constituting a heavy flywheel having a relatively large mass, and manually actuated means for intermittently energizing said flywheel and vibrating the diaphragm for a period of time extending beyond the period during which energy is applied to said flywheel.

9—In an alarm horn a signalling apparatus, a diaphragm, a rotatable member adapted to vibrate said diaphragm, and actuating means intermittently in operative engagement with said diaphragm vibrating member, said member constituting an energy reservoir having capacity to produce continuous vibration of the diaphragm during intermittent movement of said actuating means of sufficient frequency to generate a continuous note.

10—In a device of the character described, a diaphragm, and means for vibrating the diaphragm, comprising energy transmitting means, and energy receiving and imparting means of large mass receiving the energy from the transmitting means, and adapted to resist the influence of irregularly applied energy and to move with gradually increasing and decreasing velocity.

The suit is in the United States District Court for the Eastern District of New York.

### Pierce-Arrow Raises Car Prices

BUFFALO, Jan. 22—The Pierce-Arrow Motor Car Corp. has increased its prices for 1917. The touring and the 48-roadster model have been increased \$500, the model 38-closed body, \$700; and the model 48-closed body, \$800. This change makes the present price list as follows: 38-models except brougham and landaulet \$4,800, brougham and landaulet \$5,900; 48-models, roadsters and five-passenger touring car \$5,400, seven-passenger touring \$5,500, limousine \$6,800; 66-model, two and four-passenger roadsters \$6,400, seven-passenger touring \$6,500, limousine \$7,800.

### Simplex Chassis \$1,000 Higher

NEW YORK, Jan. 22—Simplex Automobile Co. has increased the price of its chassis \$1,000. The chassis now sells for \$6,000.

### Amedee Bollee, Sr., Dead

PARIS, Jan. 21—Amedee Bollee, Sr., a brother of Leon, the inventor, known in France as the father of automobilism, is dead. Mr. Bollee was the builder of a steam car in 1873.

## Lindsay Axle Not Invention

Court's Reason for Awarding Decision to Winton as Announced Last Week

CINCINNATI, Jan. 22—Lack of invention in the Lindsay axle was the reason given by the United States Sixth Circuit Court of Appeals in deciding in favor of the Winton company, appellant, on Jan. 12, in the case of Winton Motor Carriage Co. vs. Lindsay Auto Parts Co., suit for infringement of Lindsay patent No. 748,760.

The court herein takes direct issue with the opinion of Judge Clarke in the district court, which held that the Lindsay rear axle combination was novel in mode of operation and appearance.

The present hearing was before Circuit Judges Knappen and Denison, and District Judge Cochran. The decision was handed down by Judge Denison.

The court held that the principle of building an axle so that the differential could be easily inspected, and the live axle sections readily withdrawn, was not new; and that the method used by Lindsay exhibited only such skill as was to be expected by one trained in mechanics. It held that the combination had been in the main shown in two earlier patents, one to Lindsay, No. 612,360, and one to Winton, No. 610,466.

### Percy Martin on English Air Board

NEW YORK, Jan. 18—A signal honor has been conferred on an American who for many years has been one of the leading figures in automobile manufacture in England. Percy Martin, for 12 years managing director of the Daimler company in Coventry, and who was born in U. S. A. has been appointed one of a committee of three men constituting the Air Board, an assembly of business men having full control of all questions, including design, manufacture and supply of aeroplanes for all government purposes. This Air Board was appointed to solve the long-standing dispute between the army and navy as to which should control questions of design, manufacture and supply of aeroplanes. The Air Board has no control over the use of the aeroplanes once they are furnished to either the army or navy.

### Houk Director of Buffalo Trade Board

BUFFALO, Jan. 21—George W. Houk has been elected a director of the Buffalo Chamber of Commerce. Mr. Houk is president, general manager and controlling stockholder in the Houk Mfg. Co.

## Truck Owners to Fight Tax Bills

### Committee Named to Ask New York Legislature for a Scientific Schedule

NEW YORK, Jan. 22—Emphatic protest against the motor truck tax bills before the New York legislature, and an effort to get a scientific schedule evolved, resulted from the meeting of motor truck interests at the Automobile Club of America to-day.

Representatives of the Motor Truck Club of America which called the gathering, of the National Automobile Chamber of Commerce, of the Motor Truck Club of New Jersey, of the Automobile Dealers' Assn. and of similar organizations, unanimously voted to protest against the proposed rates which would increase the fees from double to fourteen times the present charges.

A plea to have a state commission appointed with sufficient funds and power to determine scientifically the relative degrees of road wear as caused by the different types of vehicles will be presented to the state authorities by a committee endorsed by this meeting.

### Claims Schedule Illegal

The motion of protest was presented by Joseph Husson, associate editor of *The Commercial Vehicle*, which has been opposing the findings of the special motor truck fee commission. This commission presented a schedule based on gross weight and the seating capacity of buses, whereas the law which created it specified that the tax basis be upon the time use of roads or the wear caused on such roads. The schedule has been opposed as unconstitutional on the theory that a commission has no right to fix taxation. Governor Whitman has coincided in this opinion; and Senate Bill No. 73 with Assembly Bill No. 123 were introduced Jan. 15 to give legal support to the commission's findings.

President Stephens of the Motor Truck Club and seven other members of the organizations represented to-day will go to Albany to ask for a hearing on these bills and to propose the scheme for a scientific schedule.

This committee will point out that motor truck owners are willing to pay their fair share of the taxes, that it is less expensive for them to pay reasonable taxes and have good roads, than to pay merely nominal taxes and have bad roads which mean constant wear and tear on the trucks.

The proposed tax is burdensome in that trucks are already taxed as personal property up to 2 per cent of their value whereas passenger cars are not, the com-

mittee will point out. It will also advise that the large number of horse wagons be taxed, and will contend that the proposed regulation would hinder the most progressive type of road transportation.

The committee will propose that the present charges be continued until the findings of the desired scientific body have been arrived at.

The Motor Truck Club of America is sending out notices to its members which are in the form of a protest to accompany the payment of registration fees on their trucks or omnibuses.

### Ayers Fisk Sales Manager

NEW YORK, Jan. 20—F. H. Ayers has been appointed sales manager of the Fisk Rubber Co., New York, with headquarters at the company's general offices at Chicopee Falls, Mass. Mr. Ayers has been with the Fisk company for many years and was formerly supervisor of districts.

### Napier Detachable Wire Wheel Patent Invalid

NEW YORK, Jan. 18—There was recently settled in England a long-standing dispute covering the basic patent of a detachable wire wheel, that is a wire wheel in which the wheel can be removed, leaving the hub with its bearings in position on the axle. This patent was for years held by J. S. Napier, formerly of the Arrol-Johnson concern, and who licensed the majority of the wire wheel manufacturers in England. The courts have decided the patents invalid and consequently any person is free to manufacture detachable wire wheels. This decision does not in any wise affect the validity of the many patents covering different methods of attachments as well as locking devices.

### Kepler Briscoe Purchasing Agent

JACKSON, MICH., Jan. 19—H. L. Kepler has been appointed purchasing agent of the Briscoe Motor Corp., this city. Six years ago Mr. Kepler left the National Cash Register Co. with C. A. Woodruff to join the Chalmers organization, where he was associated with Mr. Woodruff as assistant purchasing agent until the present change.

### Willeman Resigns from Briscoe

LANSING, Jan. 20—A. B. Willeman has resigned as superintendent of purchases for the Briscoe Motor Corp., this city.

### Schyler Leaves for Scandinavia

DETROIT, Jan. 20—W. A. Schyler who handles the export business of the Buick Motor Co. and is foreign representative for the General Motors Export Co., left Detroit this week for the Scandinavian countries.

## England Stops Car Manufacture

### 68-Cent Gasoline Restricts Use —Not Over 200 Unsold U. S. A. Cars

NEW YORK, Jan. 17—Joseph A. Mackle, Director of the Willys-Overland, Ltd., London, who for several years past has been an annual visitor at the New York shows arrived in this city to-day too late for the show, due to steamship delays. Mr. Mackle expects to be in the country several weeks and will attend the Chicago show. According to Mr. Mackle, there are not over 200 unsold U. S. A. cars in the British Isles at present. When the complete prohibition order barring importation of passenger cars into England was enforced March 21, there was on hand a 3 months' normal supply of U. S. A. automobiles. Due to government restrictions on gasoline, this 3 months supply proved adequate for 10 months, otherwise the surplus would have been exhausted months ago. At present gasoline is selling at 68 cents per Imperial gallon and each private motorist is given 2 gal. of gasoline a week for his private use. This means approximately 50 miles per week of motoring and because of such the use of cars has been very much restricted.

### Under Munitions Director

Beginning with Dec. 15, the government restricted the manufacturing of passenger automobiles in England by English makers. Previous to that time the Ford factory in Manchester and a few other manufacturers were producing passenger cars. Ford was making as high as 200 per week at its Manchester factory. Since Dec. 15 the activities of the Ford and other factories have been restricted to delivery wagons, ambulances, etc.

At present all of the automobile factories are under the direction of the Minister of Munitions and for control purposes he has divided the entire industry into three broad divisions: A, manufacture of passenger cars; B, manufacture of commercial cars; C, automobile repair work. The manufacture of class A has been stopped. A warning order has been issued to proceed more slowly in the manufacture of commercial cars. A recent order limited the amount of any one repair job to \$50. If the repair work on a passenger car exceeds this amount a special permit from the government must be obtained. This restriction has been imposed due to conservation of labor.

The extent to which manufacturing has increased in the British Isles may be illustrated by one example. Village X before the war was a straggling hamlet of a few hundred inhabitants. To-day

there are over 20,000 men employed in the manufacture of munitions, and there is one row of munition factories extending over 8 miles. The buildings are not continuous but separated as required in all munition centers.

To date there has been no conscription of labor in the British Isles and no rigid regulation of drink or food. There have been requests for the public to restrain itself in connection with these matters.

Previous to the war there were approximately 4000 dealers and garagemen in the country. Many of these dropped out of business soon after the war and those remaining have been selling U. S. A. cars and trucks. Since the importation of U. S. A. cars has ceased, many London dealers have been using their few lathes on sub-contracts for munition manufacture. London dealers have been doing a big business in buying and selling second-hand cars.

The use of taxicabs has lessened very materially but in spite of 68 cent gasoline, the rate of charge is still 16 cents a mile the same as it has been for years. Taxicabs are in general use in the heart of the city but not used much in the outlying sections. There are still 2000 passenger buses, the majority of which are operating in the more central part of the city. Women drivers are becoming common on taxicabs and light delivery wagons.

#### Batt Is Hess-Bright Sales Manager

PHILADELPHIA, Jan. 22—W. L. Batt has been made sales manager of the Hess-Bright Mfg. Co., this city, and will have entire charge of its sales after Feb. 1. Mr. Batt has been connected with this company since its early days.

#### Hutton Director of Timken Purchases

DETROIT, Jan. 22—W. H. H. Hutton, Jr., has been made director of purchases for the Timken Axle Co. The company recently held a stockholders' meeting and re-elected all of its officers with the one exception.

#### Hansen Haynes Purchasing Agent

INDIANAPOLIS, Jan. 22—C. I. Hansen, formerly of the purchasing department of the Mitchell-Lewis Motor Co., Racine, Wis., assumed his duties as purchasing agent for the Haynes Automobile Co., Kokomo, Ind., last week, succeeding C. H. Landsittel. Carl Heady will continue to serve as assistant purchasing agent for Haynes.

#### Freeman Joins Robbins & Myers

SPRINGFIELD, OHIO, Jan. 19—H. E. Freeman, formerly vice-president of the American Trust & Savings Bank, this city, has been appointed treasurer of the Robbins & Myers Co., this city, makers of electric motors, generators and fans.

## 70 Per Cent of Crude Oil for Fuel

### Independent Oilmen's Assn. Predicts Common Use of Kerosene Driven Vehicles

WASHINGTON, (Special Telegram), Jan. 24—Within 5 years 70 per cent of all crude oil produced above 30 gravity will be converted into fuel, the balance to supply the lubricants necessary to keep the engines and bearings cool, Secretary Grant of the Independent Oilmen's Assn. predicted at the zone convention here to-day.

Low-grade oils will be successfully used in carbureters much sooner than the general public expects, the society concluded. Commercial vehicles using kerosene as fuel will be in common use, it is believed; but the convention was divided on the practicability of kerosene for passenger cars.

The Independent Oilmen's Assn. went on record to-day as indorsing a discussion of the possibility that the use of kerosene may not only be made more profitable, but that soon it may be made to perform uses now impossible; that, despite improvements in refining conditions, consumption has always a little more than kept pace with them. Within from 3 to 5 years, it was agreed, due principally to the increase in the number of automobiles in use, the price of gasoline will not only be considerably higher than it is, but it will be a difficult matter to obtain the fuel in sufficiently large quantities to supply the demand; natural gas is being condensed in large volume and has demonstrated its usefulness in the satisfactory blending with lower grade products to make a merchantable article; cracking systems and processes have been tried, some proving successful, others unsuccessful, until at the present time barely three or four are considered seriously. The one thing which could solve the problem, but only temporarily, would be the adaptation of kerosene as a satisfactory fuel to internal combustion engines.

#### Some Practical Devices

Discussing the gasoline problem in connection with the need for the adaptation of kerosene as a satisfactory fuel for internal combustion engines, secretary E. E. Grant, in a report on investigations made by a special sub-committee of the association headed by Judge M. J. Byrne, Waterbury, Conn., Prof. C. E. Lucke and Prof. F. J. Metzger, both of New York, said attention of the committee had been brought to the following makers of kerosene carbureters:

John Good Inventions Co., Brooklyn; Universal Carbureter Co., Cleveland; George

Jacobs, Detroit; A. A. Wootton, Eureka, Kan.; Holley Bros., Detroit; Alfred Cohn, Warren, Pa.; Wilcox-Bennett Co., Minneapolis; Kerosene Motor Co., Peoria, Ill.; Dr. A. J. Edwards, Hot Springs, Ark.; and John Rome Battle, Germantown, Pa.

Kerosene appliances: J. W. Meaker, Jr., Evanston; Peter Orange, New York; W. G. Gehrs, Milwaukee; M. B. Hammond, Bridgeport, Conn.; H. A. Gilbert, Brooklyn; Hydro Carbon Converter Co., New York; Chemical Mixtures Collis Co., Clinton, Iowa, and C. A. Whitcomb, Stratham, N. H.  
New cracking method: Ellis Foster Co., New Jersey.

The sub-committee finally selected a kerosene carbureter manufactured by Holley Bros., Detroit, and one by John Good, Brooklyn, as, in their opinion, worthy of recommending and pushing, said Secretary Grant. He added, Holley Bros. promised to be ready within 60 days to turn out their carbureters in sufficient quantity to fill orders.

Professors Lucke and Metzger, Geo. P. Brockway, Warren, Pa., L. H. Atkinson, New York, and F. E. Vantilburg, Minneapolis, of the special committee on kerosene carbureters, were not present at the meeting Tuesday night to discuss this proposition, those present including Judge Byrne, T. B. Westgate, Titusville, Pa., T. G. Cooper, Philadelphia, and Secretary Grant.

Thomas H. Prosser and John Good drove from Brooklyn to Washington in Mr. Good's D-45 Buick, equipped with his kerosene carbureter, making the run without a stop on account of carbureter trouble. No gasoline was carried. Mr. Good gave several demonstrations.

#### Goodrich Earnings 13% on Common

NEW YORK, Jan. 24—Earnings of the B. F. Goodrich Co. during 1916 were given as amounting to \$9,550,000, or about 13 per cent on the common stock, in a preliminary report at the meeting of the board of directors held here to-day. This statement shows \$2,715,679 less than 1915 earnings, the drop being due to increased cost of manufacture without corresponding increase in prices.

The directors declared a dividend of 1 per cent on the common stock and also a dividend of 1% per cent on the preferred for the next two quarters.

#### Two Genolite Lighting Systems

DETROIT, Jan. 22—The Detroit Starter Co. hereafter will sell its Genolite electric lighting system for Fords in two models—Type C at \$2,985 and Type D. These systems are the same except that the Type D includes a windshield spotlight with a 7-in. door and a mirror. Type C system includes a generator, storage battery, side lamps, tail lamp and head lamp control. The equipment can be installed in 2 hr. and requires no machine work. One feature of the installation is that it automatically controls the current flowing through the headlamps so that their brilliancy remains constant at all car speeds.

## Maxfer Brings Out 1-Ton Truck

Has Worm-Drive, Electric Lighting and Non-Stall Differential—Price \$1,195

CHICAGO, Jan. 23—The Maxfer Truck & Tractor Co., which has been making truck forming attachments for Ford cars, is bringing out a new 1-ton truck complete which will be styled the Dependable and will sell for \$1,195. The truck is equipped with a four-cylinder, 3½ by 5 in. engine, is worm-driven and has a number of features including electric lighting and starting equipment and a Bailey non-stall differential. The wheel-base is 130 in. and the loading space 4 to 6 ft. wide and 9 to 11 ft. long, according to the type of body. Rear tires are solid pressed-on type 34 by 4. The equipment includes cab curtains and a windshield.

The new truck together with the Maxfer company's "whale for work," the Ford converting unit, will be exhibited at a special showroom directly opposite, the Coliseum at 1512 South Wabash Avenue. During the show the company will make its headquarters at this salesroom. The company will produce 28,000 of its truck units this year and in addition will produce 2000 of the Dependable models. The Chicago plant is being quadrupled in size and in addition there is a plant at Martinsburg, Va.

The Maxfer company will give a dinner at the Chicago Athletic Assn., Jan. 31, for its dealers and salesmen.

### Murray to Head National Rubber

POTTSTOWN, PA., Jan. 20—James A. Murray, vice-president and general manager of the Seamless Rubber Co., New Haven, Conn., will take the presidency and general management of the National Rubber Co., this city, on March 1. Mr. Murray is one of the most widely known men in the rubber industry, having been with the Seamless company 22 years.

Jacob G. Feist, who retires as president of the National company, becomes commercial and sales manager.

### E. L. Ferguson, Pioneer Tourist, Dies

WASHINGTON, Jan. 19—Ernest Lincoln Ferguson, better known in the automobile field as Fergy, died to-day. Mr. Ferguson was the manager of the local bureau of the American Automobile Assn. He was 51 years old and is survived by a widow and two children.

Mr. Ferguson was a pioneer blazer of trails throughout the country. Since the inception of the automobile he made logging and signmarking highways his life's work. He was the director of several national tours, the Munsey, and the

New York-Atlanta. He acted as official starter in the past Glidden Tours and managed a number of automobile contests. At one time he was automobile editor of the New York *Evening Mail* and connected with *Motor Age* when that publication first began.

One of Mr. Ferguson's notable achievements was the piloting of the first merchandise-carrying motor truck from New York to San Francisco.

### Trego Resigns from Knox and Springfield Motors

SPRINGFIELD, MASS., Jan. 19—F. H. Trego has resigned as chief engineer of the Knox Motors Co., and of the Springfield Motors Co., of which he was works manager and a vice-president. He has been succeeded by E. R. Gurney as chief engineer at the Knox plant. Mr. Gurney was formerly in the engineering department, General Electric Co., having been with that company nearly 15 years.

### Raise \$100,000 for Factory

FOSTORIA, OHIO, Jan. 23—E. W. and W. O. Allen of the Allen Motor Co. outlined their plans to 300 members of the Chamber of Commerce yesterday. The meeting was for the purpose of raising \$100,000 stock subscription for an automobile body plant to be built in addition to a \$150,000 automobile factory which the Allen company will build on a 55-acre tract of land recently purchased by that concern. More than \$110,000 worth of stock was subscribed for the body plant within 15 minutes.

### Stewart-Warner Earns \$2,215,043

CHICAGO, Jan. 24—The Stewart-Warner Speedometer Corp., this city, earned \$2,215,043 in the year ending Dec. 31, 1916. This is an increase of \$184,423 over 1915, and equivalent to approximately 21½ per cent on the \$10,000,000 common stock after payment of dividends on preferred now retired.

### Lamson Truck Adds

CHICAGO, Jan. 22—The Lamson Truck and Tractor Co., formerly known as the Zeitler & Lamson Truck Co., this city, has completed an addition to its plant. Additional space on account of increased business for 1917 will be needed before the expiration of the year. After reorganizing this company decided to enlarge the scope of its business and has entered into a selling campaign for national and international distribution.

### Economy Motor Co. Repudiates Merger

TIFFIN, OHIO, Jan. 24—The Economy Motor Co. has repudiated the merger which had been arranged for with the Bellefontaine Automobile Co. and will soon float an issue of stock to increase its Tiffin plant.

## British Tanks Built at Lincoln

High Wall Surrounded Factory  
—Two Six-Cyl. Daimler Sleeve-Valve Engines

LONDON, ENG., Jan. 6—Much of the secrecy which surrounded the manufacture of the now famous automobile tanks has been dissipated. No war device built in England is kept such a secret as the tanks. They were built at Lincoln where a high wall surrounded the factory. The workmen entered this inclosure and were not permitted to leave it or see their families for a period of 3 months. Each tank is fitted with two six-cylinder Daimler sleeve-valve motors of approximately 150 hp. The tank has four forward speeds, the maximum being 6 m.p.h.

### Paige Orders Increase 300 Per Cent

DETROIT, Jan. 24—The Paige-Detroit Motor Car Co., this city, reports an increase in present orders of 300 per cent over a year ago. At the stockholders meeting it was reported that 39 per cent cash dividends was paid on average capital stock paid in 1916 with a capital stock increase of 108 per cent in value during the same year.

### Springfield Bodies from Detroit Plant in 60 Days

DETROIT, Jan. 24—The Springfield Body Corp. at its annual stockholders' meeting reported that the local plant is 75 per cent completed, and that the corporation would be shipping bodies from its plant within 60 days. The company has licensed thirteen manufacturers to build the Springfield type body on a royalty basis and thirty-two automobile companies have adopted it as standard equipment.

### Sedan Body to Build

UNION CITY, IND., Jan. 24—The Sedan Body Co., this city, will complete its new building in June. The brick structure will be two stories and will have 54,000 sq. ft. floorspace. C. C. Adelsperger is president and general manager and C. C. Koontz is secretary and treasurer. Two hundred men will be employed.

### Houk Mfg. Co. Adds

BUFFALO, Jan. 24—The Houk Mfg. Co., this city, is building an addition to its factory at a cost of \$26,000.

### Champion Factory Ready Feb. 1

FULTON, ILL., Jan. 21—Champion Motor Car Co. will start production in its reconstructed factory Feb. 1. The output within 6 weeks from this time will be 270 light delivery cars per week.

## Hackett and Gem To Move

Jackson, Mich. and Delaware  
Companies Will Locate in  
Grand Rapids

GRAND RAPIDS, MICH., Jan. 22—This city is to have two new automobile manufacturing plants, announcement having been made that the Hackett Motor Car Co., now located in Jackson, Mich., and the Gem Motor Car Co., recently organized under the laws of Delaware, will build here.

At present the Hackett plant gives employment to about 200 men. A \$50,000 factory will be erected in this city.

The Gem company was organized about a month ago with an authorized capital of \$250,000 of which \$150,000 is yet to be issued. The intention of the company is to buy chassis and bodies complete and assemble them here. Some of the parts will be manufactured here. A light four delivery car, capacity 1000 lb., is being assembled in Detroit.

### Over 250 Attend Champion Convention

TOLEDO, Jan. 22—The third annual get-together and banquet of the Champion Spark Plug Co. was held at the factory Jan. 20, the banquet being held at the Toledo Club that evening. More than 250 persons were present. Each year the Champion company runs a train of special cars to its plant, carrying engineers and other officials from the Detroit motor car factories.

### Convention at Packard Plant

DETROIT, Jan. 20—A 2-day convention for dealers and truck sales managers started Friday at the Packard factory. Sales plans for 1917 were discussed. Representatives from fifteen Packard agencies were present.

### Everitt Resigns from Raybestos

BRIDGEPORT, CONN., Jan. 24—Richard Everitt, sales manager of the Raybestos Co., this city, has resigned, effective tomorrow. For the present his assistant, M. S. Judd, will assume his duties.

### Schwartz Wheel to Add

PHILADELPHIA, Jan. 19—The Schwartz Wheel Co., this city, has acquired property about 160 by 200 ft., adjoining its plant, to be used for extensions.

### Durant Interested in Iron Co.

SAGINAW, MICH., Jan. 20—The Saginaw Malleable Iron Co. has been incorporated here with a capital of

350,000 to employ 450 men and to have 12,000 tons capacity. Active operations will begin July 1. Among the principal stockholders is W. C. Durant of the General Motors Co. This industry has been brought to this city through the efforts of G. H. Hannum, general manager of the Jackson-Church-Wilcox Co., a division of the General Motors Co.; C. F. Drozeski of Chicago and J. B. Kirby of Saginaw. Mr. Drozeski will be the manager of the concern.

### Continental Motors Buys Land

DETROIT, Jan. 20—The Continental Motors Co. has purchased a block of property in this city which now rests in the Continental Realty Co., a concern organized by B. F. Tobin and R. W. Judson, president and vice-president respectively of the Continental Motors Co. The property includes what was known as the Hovey plant on Western Avenue between Third and Fourth Streets.

### Fageol in Production in March

DETROIT, Jan. 23—Production will be started in March on the 2-ton truck designed for the Fageol Motors Co., Oakland, Cal., by Cornelius T. Myers of this city. The 5-ton chassis will embody more of Myers' chassis lubrication principles which were described in THE AUTOMOBILE for Jan. 18, on page 185. The basic idea behind this system of lubrication is the elimination of grease because of its dirt-carrying propensities and the substitution of oil with wick feed.

A factory is being equipped in Oakland, Cal., for the manufacture of these trucks and the Fageol passenger car. Louis Bill, formerly general manager of the Jeffery Co., and Webb Jay of the Stewart Warner Corp. are respectively president and vice-president of the company.

### S-S-E Co. Erects Plant

PHILADELPHIA, Jan. 19—The S-S-E Co. has erected a factory for the construction of the S-S-E car. The plant is located on a 20-acre tract of land at B Street and Erie Avenue, and is 360 by 90 ft., of brick and steel, with overhead prismatic lighting. Machinery is being installed with provision for individual electric drive of each unit in the shops.

The new car will be coming out inside of 4 months, and the company expects to produce 500 in the first year.

### Muzzy-Lyon to Make Aeroplane Parts

DETROIT, Jan. 21—D. W. Rodger of the Muzzy-Lyon Co., Ltd., manufacturers of motor bearings, has completed arrangements with the Duesenberg Motor Co. to furnish it with bearings to be used in the engines it is now building for the government aeroplanes.

## Rush Oakland Plant Additions

New Northway Engine Factory  
Will Double Present  
Output

PONTIAC, Jan. 20—The Oakland Motor Co. is pushing construction work which will add 5 acres of floorspace to its plant and plans to complete it by Feb. 15. A new engine plant, which will build the Oakland Northway motors and will double the present output by employment of 1200 to 1500 men, is a part of the present expansion. Others include a machine shop, one-story high, 80 ft. by 442 ft., engine assembly, one-story high 80 ft. by 242 ft., engine test, one-story 80 ft. by 242 ft., machine shop office not yet under way, one-story 70 ft. by 137 ft., final assembly, three stories, 93 ft. by 238 ft.

These structures which will have 227,280 sq. ft. of floorspace will increase the total floorspace of the factory to 638,280 sq. ft.

### Over 25,000 Cars Sold in 11 Months

DETROIT, Jan. 22—The Hudson Motor Car Co. sold and delivered 25,000 Super-Sixes in the first 11 months following its introduction to the public.

### Autocar Offers Service Kit

NEW YORK, Jan. 20—One of the most progressive steps ever taken by a motor truck manufacturer to give the owners of its trucks quick and efficient service has just been made by the Autocar Co., Ardmore, Pa., which to-day offered its Autocar service kit. This consists of a trunklike box in which are furnished a selected list of spare parts for Autocars. The parts included in the box are determined by a consideration of the number of such trucks the owner may have and whether he is located 1 mile or many miles away from the nearest Autocar branch, service station or agency.

### Maxwell Assembly in St. Louis

ST. LOUIS, Jan. 23—The Maxwell Motor Sales Corp. has leased 30,000 sq. ft. of floorspace in the plant of the St. Louis Car Co. and will use this for a temporary assembling plant for the Southwest. Testing yard space of 20,500 sq. ft. also has been obtained, and it is stated that the Maxwell company contemplates the erection of a branch factory here.

### Form Standard Electric Mfg. Co.

INDIANAPOLIS, Jan. 22—The Standard Electric Light Co., capitalized at \$100,000, has been formed to manufacture an automatic light control device. The in-

vention enables a car owner to set the time when the lights of his machine are to be turned on. The mechanism is not operated by clockwork, but by gravity. The company expects to erect a concrete and steel factory within a year at Indianapolis. The stock is all common, divided into 10,000 shares at \$10 per share.

E. C. Applegate is the inventor of product and is chief executive of the company; D. H. Duncan is vice-president; Ralph E. Potts and Frank E. Hall will be in charge of the sales.

#### Bethlehem Motor to Build

ALLENTOWN, PA., Jan. 19—The Bethlehem Motor Corp., this city, recently organized, is arranging to erect the initial buildings of its proposed plant for the manufacture of commercial vehicles. The plant will be on property acquired along the New Jersey Central Railroad and will be equipped to produce 2000 trucks the present year.

#### Farmer Boy Tractor Plant Inadequate

COLUMBUS, Jan. 20—The McIntyre Manufacturing Co., this city, maker of the Farmer Boy tractor, has purchased a tract of 12 acres on West Goodale Street upon which will be erected a large factory 100 by 200 ft. The present plant at 127 West Locust Street is too small to take care of the increased demand for tractors. Construction will be started soon.

#### Briggs Secures Harroun Contract

DETROIT, Jan. 22—The Briggs Mfg. Co. has contracted with the Harroun Motors Corp. for the assembling and trimming of Harroun bodies, and will use a part of the Prouty & Glass plant at Wayne for that purpose.

#### First Shipments of J. & D. Tires

CHARLOTTE, N. C., Jan. 22—Six sizes of tires have been included in the first shipments of the J. & D. Co. to its distributors. The company has limited its production to the more popular sizes, namely: 30 by 3, 30 by 3½, 31 by 4, 33 by 4, 34 by 4, and 36 by 4½.

## Freight Congestion To Continue

### N. Y. C. President Sees No Immediate Relief in Sight—Asks Cooperation

NEW YORK, Jan. 23—Little hope is held out for quick relief from the freight congestion by the railroads of the country, according to an open letter from A. H. Smith, president of the New York Central Lines, to F. P. McQuade of the American Druggists' Syndicate.

The sudden prosperity and increased production brought upon the railroads a demand for 40 per cent more service in many instances. The roads have not had the reserve to meet this demand and cannot build facilities in a short time. Moreover, the companies are hampered by the greater cost of materials and the shortage of labor.

Cooperation and patience is asked from the public. The big railroads have placed orders for hundreds of engines and cars which will in time relieve the situation. Mr. Smith blames the difficulty in part on the excess amount of Government regulation. He concedes that regulation is necessary, but calls attention to the large number of state and local commissions which supplement the Interstate Commerce Commission and hamper the efficiency of the railroads.

#### Drives 75 Cars to Fostoria

LANSING, Jan. 20—A fleet of seventy-five cars left the Reo Motor Car Co. plant yesterday for Fostoria, Ohio. The fleet is being driven to its destination because of freight car congestion. Another trip of similar dimensions will be made next week. The two fleets take the entire output of the Reo company for one day.

#### Car Shortage Worse Than Before

DETROIT, Jan. 20—According to J. S. Martin of the National Automobile Chamber of Commerce, who is in this

city in an endeavor to relieve freight congestion, the shortage of freight cars for automobiles is worse now than it has ever been in the past and not more than 50 per cent of the required number of cars is being delivered to the factories. Local men place the number at 15 per cent. A meeting of traffic men was held last Thursday and devoted entirely to the collection of data concerning the shortage.

#### Embargo Declared in Detroit

DETROIT, Jan. 23—An embargo has been declared on all freight excepting coal, live stock and food products, through the Toledo gateway to Detroit, which it is expected will relieve the serious shortage of coal that is now threatening the Ford Motor Co., the Packard Motor Car Co., and the other automobile manufacturers in this city. At the same time that the embargo lifts the difficulties of coal shortage, it adds to the troubles of car makers insofar as it hinders all shipment of automobiles by way of Toledo.

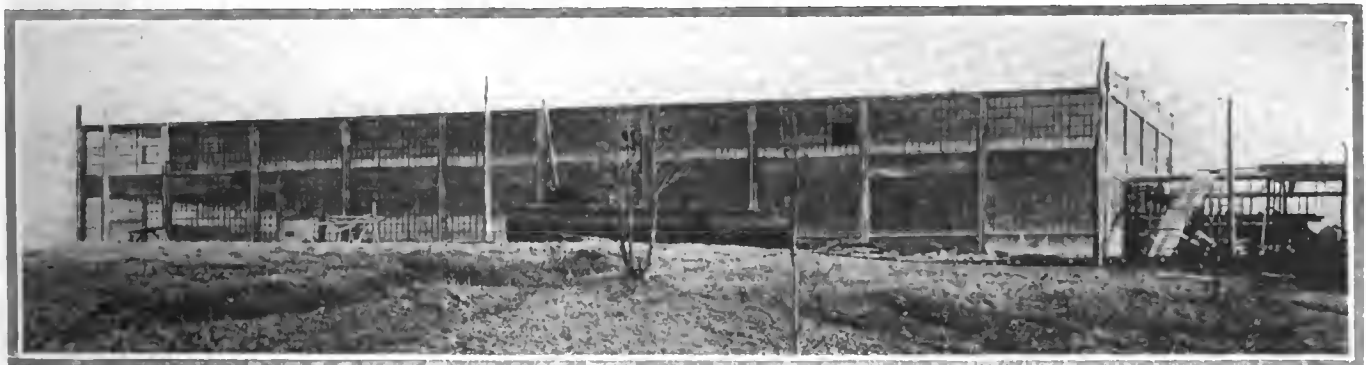
At this time it is estimated that 14,000 automobile freight cars are needed beyond the present supply, to handle automobile shipments.

#### Goodyear School for Deaf Mutes

AKRON, Jan. 21—Deaf mutes in the employ of the Goodyear Tire & Rubber Co. now have the benefit of a special division of the company's factory schools. The chief subjects taught are business arithmetic, English and mechanical drawing. A deaf-mute literary society and athletic teams have been formed. Ashland D. Martin, a deaf-mute graduate of Gallaudet College, is in charge of this work.

#### Keeler's Novel Bonus System

GRAND RAPIDS, Jan. 20—A unique bonus and profit-sharing system has been inaugurated by the Keeler Brass Co., manufacturer of automobile castings. The company opened a bank account for each employee on Jan. 2, rated in amount according to length of service and po-



New factory of the J. & D. Co., Charlotte, N. C., which has just started shipping tires to its distributors



sition occupied. In addition to the bank's 3 per cent interest the company will pay 5 per cent for all money deposited for a year, provided the worker is still in the employ of the concern. A sickness insurance plan is also in force which requires each employee to deposit 25 cents a week, and an equal amount is contributed by the company. A 5 per cent weekly bonus is paid to all employees who are punctual.

#### Dealers' Licenses May Be Withheld

SACRAMENTO, CAL., Jan. 18—About 200 automobile dealers throughout California are in difficulty with the motor vehicle department of the State because they did not comply with the motor vehicle law which requires them to report all sales of automobiles to the department in this city, and the superintendent of the department has refused to issue dealers' licenses to all such dealers. As matters stand now they will be forced to take out individual licenses for every car they demonstrate or operate.

#### Meara Can't Sell Carbureter Rights

TOLEDO, Jan. 20—David C. Meara has been restrained by court order from the sale of patent rights on a new carbureter improvement. The injunction was granted on application of R. W. and Fred Overmyer and J. Q. Adams, who claim they have purchased the patent from Meara and are now manufacturing it.

#### Pfeffer President Realty Company

DETROIT, Jan. 22—C. A. Pfeffer, former vice-president of the Chalmers Motor Co., has been made the president of the Prudential Realty Co., a concern whose capital was recently increased to \$1,000,000.

#### Weber With Eugene Meyer & Co.

NEW YORK, Jan. 22—Orlando Weber, who recently resigned as director of the Maxwell Motor Co., Inc., has joined the banking firm of Eugene Meyer & Co.

#### Permanent Products Co. Formed

CLEVELAND, Jan. 19—The Permanent Products Co. has been formed to manufacture metal products. Its capitalization is \$1,000,000 and the incorporators are R. D. and G. R. Stevenson, L. B. Foote and W. A. Thompson, all of this city.

#### Darland Manages Tulsa Company

TULSA, OKLA., Jan. 22—C. E. Darland has been appointed general manager of the Tulsa Automobile Co. W. A. King has been made factory and production manager. The Tulsa Four, the company's product, was recently exhibited at a local hotel.

## Plans Tests for Brake Linings

### Asbestos Brake Lining Mfrs. Assn. Preparing for Tests by Laboratory

NEW YORK, Jan. 23—Disinterested tests of brake linings are to be made by the Asbestos Brake Lining Mfrs. Assn. The association is at present preparing a way for these tests, which will be made by a well-recognized laboratory. The idea behind the test is that they will be of value to manufacturers in showing them the qualities resulting from various methods of construction, etc. It is also planned to do some general as well as engineering work, such as the provision of tariff protection with this young industry, etc.

The association was formed July 28, 1916, the president being A. H. Burdick of the Standard Woven Fabric Co., and the secretary and treasurer, C. J. Stover of Keasbey & Mattison Co. Among the members are the following firms: American Asbestos Co., Norristown, Pa.; Asbestos & Rubber Works of New Jersey, Camden, N. J.; General Asbestos & Rubber Co., Charleston, S. C.; Essex Rubber Co., Trenton, N. J.; Federal Asbestos Co., Paterson, N. J.; F. L. Horton Mfg. Co., Boston, Mass.; Keasbey & Mattison Co., Ambler, Pa.; Russell Mfg. Co., Middletown, Conn.; Manhattan Rubber Mfg. Co., Passaic, N. J.; Standard Woven Fabric Co., Walpole, Mass.; Staybestos Mfg. Co., of Philadelphia, Pa. The offices of the association are at Ambler, Pa.

#### Packard Makes Promotions

DETROIT, Jan. 21—C. F. Tollzien, has been made production manager of the Packard Motor Car Co., and will retain his present work as purchasing agent and manager of the service division. D. F. Roberts has been made the factory manager. Mr. Roberts was formerly the superintendent of the factory. J. E. Leher has been appointed as manager of the motor carriage division in charge of chassis and body manufacture. R. N. Brown has been made superintendent of the chassis division, and L. E. Jolls has been promoted to be mechanical superintendent.

#### Connell, S. A. E. Secretary, Dies

MILWAUKEE, WIS., Jan. 23—Herbert L. Connell, secretary of the Mid-West section of the S. A. E., and instructor in automobile practice in the Milwaukee Continuation School system since 1914, died at his home in Milwaukee on Friday, Jan. 19, aged 29 years. Mr. Connell was a native of Detroit and was graduated

from the University of Michigan, college of mechanical engineering, in 1911. He was associated with several Detroit factories, including the Packard, for 3 years before coming to Milwaukee. He was a member of the committee on standardization of the S. A. E., and a well-known writer on technical subjects. Mr. Connell was a member of the Milwaukee Press Club. The funeral was held Monday, Jan. 22.

#### Schipper Will Address S. A. E.

DETROIT, Jan. 23—J. Edward Schipper, technical editor of THE AUTOMOBILE, will address the next professional session of the Detroit Section of the Society of Automobile Engineers, to be held at the Hotel Ponchartrain Feb. 16. Mr. Schipper will review the national automobile shows. Engineers from Flint, Ann Arbor, Toledo and Jackson will visit Detroit for the address and will make the trip in special trains.

#### Detroit S. A. E. Nominating Committee Formed

DETROIT, Jan. 23—The nominating committee to nominate officers of the Detroit Section of the Society of Automobile Engineers at the March meeting has been appointed and includes H. E. Coffin, vice-president and consulting engineer of the Hudson Motor Co.; J. G. Vincent, vice-president of engineering for the Packard Motor Car Co.; H. W. Alden, chief engineer for the Timken-Detroit Axle Co., and H. A. Brown, engineer for the Hyatt Roller Bearing Co.

#### May License All New York Drivers

ALBANY, N. Y., Jan. 19—All persons, owners or chauffeurs who operate automobiles in New York will be compelled to obtain drivers' licenses from the Secretary of State, according to a safety-first bill introduced last Tuesday by Assemblyman J. D. Kelly. The proposed law calls for the suspension and possible revocation on a third conviction of speeding during a year. This also affects intoxicated persons and those who attempt to escape after having run down a pedestrian.

#### Kelsey Elected President D. A. C.

DETROIT, Jan. 21—John Kelsey was elected president of the Detroit Athletic Club, at a meeting of the board of directors, to succeed Hugh Chalmers who is retiring. He is president and general manager of the Kelsey Wheel Co. Other officers elected were A. E. Larned, first vice-president; Roy D. Chapin, second vice-president; Julius Haass, treasurer and C. A. Hughes, secretary. These officers will serve a term of 3 years.

# Latin - American Market Gains

## Continued Demand for American Cars—Few Exported to United Kingdom

WASHINGTON, Jan. 22—Latin-America continues to be the banner market for U. S. A. cars, as is shown by the government statistics of exports. Argentina ordered 4644 cars in the first 11 months of 1916, Chile 1129, Brazil 392, Venezuela 908, other South American countries 950, and Mexico 611. Canada doubled the imports of 1915, buying 11,777 cars; and Australia purchased 7337 cars as against 4426 in 1915.

Although Mexico has presumably been in a state of financial ruin the country has imported nearly six times the number of cars ordered the year previous, when 109 automobiles were imported.

The European market in the main is holding strong, despite the adverse legislation in some of the Allied countries, and the blockading of the Central Powers. France bought 7881 cars in the first 11 months of 1916, which was 2000 more than for the same period in 1915, this in spite of the fact that there is a 75 per cent tariff on passenger cars. The gain is probably chiefly in motor trucks and ambulance cars. This is likely also the case in Russia where 3110 machines have been imported from America.

Denmark purchased 1407 cars valued at \$1,050,457, and Italy imported 256 automobiles, a gain of thirty over the preceding year. A sharp decrease was felt in the market of the United Kingdom, where the importation of passenger vehicles has been prohibited. This year only 8601 cars were imported as against 22,990 the year before.

The blockade prevented any cars from reaching Germany, and this was practically effective the year before. There has been a decrease in exports to minor European countries.

Not only in South America is there encouragement for the American manufacturer, but also in British East Indies which imported 3996 cars, in the West Indies where trade was double that of the previous year, and in Asia which showed a 100 per cent increase in demand.

### New 18-Cylinder Aero Engine

DETROIT, Jan. 23—An eighteen-cylinder engine constructed by P. W. Murphy, manager of the camshaft department of the Studebaker Corp., and W. E. Looney, S. Smith and S. Pepilinski, also Studebaker employees, is on exhibition at the National Automobile School, here. The motor is intended for aeroplane purposes and is cam-driven with opposed cylinders and little head resistance. It has no crankshaft and the drive is on the drum cam. Present weight is 270 lb., but it is expected that this will be reduced to 200 lb. The motor yields 120 hp.

### Brazil Needs Magnetos

WASHINGTON, Jan. 22—Brazil now furnishes an excellent market for magnetos, according to consular reports. Before the war the supply came chiefly from Europe. The bureau of foreign and domestic commerce will supply the names of probable customers for American makes upon inquiry at the Washington or branch offices.

### \$4,800,000 for Hydroaeroplanes

WASHINGTON, Jan. 24—A total of \$4,800,000 has been recommended by the House Committee on Fortifications for putting squadrons of hydroaeroplanes in coast defenses. The measure is expected to pass.

# Export Co. Has Wide Scope

## American Motors, Inc., Formed to Serve Automobile Makers in Foreign Business

NEW YORK, Jan. 19—A comprehensive service to all the automobile manufacturers in the various countries which do or contemplate doing an export business is outlined in the plans of the American Motors, Inc., this city, just formed. This export service is based on the principle and practice of intensive coordination and its activities embrace every step in the transfer from the American maker or seller to foreign buyer of any and all products related to the automobile industry. Purchasing, financing, packing, shipping and insuring of the products covered by the automobile industry for export, are included.

Through arrangements perfected with its banking connections, it is prepared to finance for foreign purchasers their shipments, covering payments to the manufacturer, packing, shipping, insurance, and such other incidental charges as are requisite in the completion of a shipment of merchandise to any part of the world.

As European conditions settle back into the normal there will be a demand for the American tools and parts. To co-operate with foreign producers along this line is a vital part of the plan of the American Motors, Inc. To this end a large amount of data has been assembled and classified for immediate use. Its technical department is prepared to furnish data, blue prints, specifications, etc., covering all classes of automobile parts or machinery. It is its intention, in addition to the packing department, which it has established in Brooklyn, to have a branch of same at Detroit, in order that purchases made from different manufacturers located in the Central West can be packed under one cover and shipped in one carload.

According to plans, a foreign buyer, by stipulating his automobile requirements to the company, will be served promptly. The company will have competent men in the field of automobiles, tractors and parts who will execute these purchases.

To simplify and expedite financial arrangements between shippers and foreign consignees is one of the features of the company's plans. The company has banking connections in the important foreign cities thus affording facilities for credits. These banking houses are correspondents of its local banking connections and through them credit may be established for all purchases to be negotiated through the American Motors, Inc. Where accessories are to be pur-

### Exports of Automobiles, Trucks and Parts for November

	November			
	1915		1916	
	Number	Value	Number	Value
Passenger cars .....	3,690	\$2,791,507	5,337	\$4,016,930
Commercial cars .....	1,553	3,837,307	1,655	5,175,114
Parts, not including engines and tires .....	.....	1,693,787	.....	2,151,434
	5,243	\$8,322,601	6,992	\$11,343,478

### NOVEMBER AND 10 PREVIOUS MONTHS, BY COUNTRIES

Denmark .....	.....	.....	1,407	\$1,050,457
France .....	5,881	\$14,887,732	7,881	21,381,352
Germany .....	4	2,800	.....	.....
Italy .....	226	144,874	256	158,003
Russia .....	.....	.....	3,110	8,464,071
United Kingdom .....	22,990	33,088,549	8,601	15,576,155
Other Europe .....	8,032	21,057,550	3,633	4,452,544
Mexico .....	109	102,402	611	523,186
Canada .....	5,448	4,363,821	11,777	8,513,315
West Indies and Bermuda .....	2,940	1,680,168	5,471	3,625,825
South America .....	.....	.....	.....	.....
Argentina .....	.....	.....	4,644	2,480,092
Brazil .....	.....	.....	392	256,878
Chile .....	.....	.....	1,129	769,080
Venezuela .....	.....	.....	508	324,992
Other South America .....	.....	.....	950	605,881
British East Indies .....	2,786	1,498,578	3,996	2,907,067
Australia .....	4,426	3,703,976	7,337	5,529,626
Asia and other Oceania .....	3,749	5,985,446	8,733	9,750,664
Other countries .....	2,039	1,737,181	4,172	2,898,569
	58,630	\$88,253,077	74,608	\$89,267,757

chased in addition to complete chassis the company will so plan the buying, packing and shipping as to effect the greatest possible saving in the grand total.

As planned, sight drafts will be drawn on the consignee and attached to the documents covering the shipment. In the event of drafts being drawn on the consignee at 60 or 90 days sight, the company will endeavor to arrange credits with the consignee's bankers or with its banking correspondents.

#### Harroun to Justify Product

DETROIT, Jan. 24—The Harroun Motor Corp. will appear before the Michigan Securities Commission to-morrow in Lansing for the purpose of establishing the fact that the company is producing a meritorious car at a fair price.

In order to do this it has summoned a number of experts to testify as to the merits of the design and sales possibilities. Besides the officers of the company, J. G. Monihan, president; Ray Harroun, vice-president, and John Plath, director of merchandising, there are the following disinterested engineers: Professor David Gallup, J. B. Replogle, Major M. B. Hawxhurst, Victor Kliesrath, C. A. Armstrong, Vice-President Cutting Armstrong and Smity, Fred Wagner and Ralph De Palma.

Those appearing as experts on selling possibilities of the car are: J. W. Leavitt, of San Francisco; R. H. Schmittiel, of Wetmore, Quinn, Paige and Harroun distributor; George Franklin, Dort distributor; L. J. Robinson, president of the L. J. Robinson Co., Chalmers distributor. To show the value of the plant, M. D. Smith, president of the A. J. Smith Construction Co. The reports of the auditors and appraisers will also be submitted to show the probability of the company.

#### Briggs-Detroit Settlement Decided

DETROIT, Jan. 20—Creditors of the Briggs-Detroit Co., which failed in March, 1914, will receive about 26 per cent of their claims. The total claims allowed are \$483,287, and total realized assets were \$143,432. Taxes amounted to \$5,177, preferred creditors have been paid \$36,359, labor claims amounted to \$2,461, and dividends paid unsecured creditors were \$77,287. The trustee still retains a balance of \$12,227.

#### Will Sell Victor Assets

DETROIT, Jan. 20—The referee in bankruptcy has ordered a sale, to be held Feb. 2, of the machinery and building, valued at \$43,000, of the defunct Victor Mfg. Co., makers of bodies. Liabilities amount to \$45,000.

## 63,000 1917 Cars for Philadelphia

41,600 Sold in That Territory in 1916—Show Attendance 100,000

PHILADELPHIA, Jan. 20—At the record-breaking sixteenth annual automobile show held in the Commercial Museum it was brought out that 41,600 cars were sold in this territory during the past year and the sales for 1917 are conservatively estimated at 63,000.

There were 117 exhibitors at the show, sixty-six showing cars and fifty-one accessories. Of the 280 cars on view, ninety-five were touring cars, eighty-five closed cars, fifty-seven roadsters, thirty were chassis, and eleven electrics. The show opened Friday evening, Jan. 12, while the New York show was still open. Attendance was close to 100,000, the daily average being over 10,000.

Commercial Museum, the new exhibition building, is the largest single-story structure in the city, being about 300 ft. square, with 75,000 sq. ft. of floorspace, as compared with 50,000 sq. ft. available for last year's show and only 27,000 sq. ft. the previous year. Decorations for this year's exhibition were of an Oriental character, and original in conception and execution. Despite an outlay of \$40,000 on the show, the Philadelphia Automobile Trade Assn. will have a balance in the treasury and will be able to grant rebates to exhibiting members.

General prosperity, due in large measure to the high prices caused by the war for Pennsylvania products, is responsible for the great expansion of the automobile business in this territory. Philadelphia is the center for the outlet and utilization of the enormous natural resources in oil, coal and minerals of Pennsylvania, the first State in the Union in the manufacture of iron and steel and the second in textile products. War profits in all these fields center in this city and it is only natural that car-buying should increase remarkably in proportion. Bank clearings in 1 day during the past week suffice to reflect these conditions:

City	1917	1916	1915
Philadelphia	\$62,503,236	\$38,287,154	\$26,114,275
Boston	46,776,627	38,442,103	26,683,258
Chicago	83,049,524	67,126,923	54,568,426
St. Louis	21,541,055	17,124,279	14,924,573
Baltimore	8,675,174	6,944,510	6,566,250
New York	716,209,433	554,273,111	300,902,163

It will be noted that Philadelphia shows the greatest percentage increase though the total clearings are third on the list.

#### For After-War Trade

Philadelphia intends to make this prosperity permanent. No other city per-

haps has better prepared for a resumption of foreign trade after the war. During the first 11 months of the past year the export business totalled almost \$300,000,000—more than double that of the previous year. Additional lines of steamships are being established for trade in foreign countries, and more than 100 vessels are under construction on the Delaware. All the wharves, piers and docks owned by the city are loaded and the demand for such facilities is increasing.

Moreover, it must be remembered that it is not from the State of Pennsylvania alone that Philadelphia draws its trade, though that alone would make it a great port. Three railroad systems center here and connect it with the West, and this city is preparing for a still greater expansion of business from this quarter.

More active promotion of good roads work is planned for the coming year when the State Highway Department will ask the Legislature to devote the \$3,000,000 revenues from automobile license fees entirely to maintaining the 10,200 miles of State roads: \$10,000,000 for 2 years' reconstruction of State highways in accordance with Sproul act provisions for connecting centers by beginning simultaneously at both ends; an appropriation for aiding boroughs in building State roads; and an appropriation to allow the continued absorption of toll roads around Philadelphia.

This good roads program means a still more marked increase in the sales of cars in this territory.

#### Dearborn Truck Reorganized

CHICAGO, Jan. 22—The Dearborn Motor Truck Co., this city, has reorganized as the Dearborn Truck Co. and the capital has been increased to \$550,000, of which \$200,000 is to be preferred stock.

S. D. Porter, who was formerly vice-president and general sales manager of the Smith Form-A-Truck Co., has purchased an interest in the new company and has become vice-president, treasurer and general manager. W. J. Kenrick, who founded the Dearborn Motor Truck Co. last March, remains as president of the new company. C. E. Stuart, formerly assistant general sales manager of the Smith Form-A-Truck Co., has become sales manager of the new company.

#### Kunz Wheel Co. Formed

MILWAUKEE, Wis., Jan. 20—The J. L. Kunz Machinery Co., Milwaukee, established 25 years ago, has reorganized as the Kunz Wheel Co., with \$100,000 capital, to devote its attention exclusively to the manufacture of resilient sheet steel wheels for automobiles and trucks, designed by J. L. Kunz.

# Aero Show Exhibitors

Over Sixty Listed, Half of Them Being Members of the M. & A. M.

NEW YORK, Jan. 23—Over sixty aeroplane, motor, parts and accessory makers have taken space at the coming initial Pan-American Aeronautics Exposition at Grand Central Palace, Feb. 8 to 15. Over half of these exhibitors are members of the Motor and Accessory Manufacturers, which recently sanctioned the event.

Many automobile manufacturers are either producing aeroplane motors to-day or else designing aeroplane motors for future delivery. With the recent appropriation of \$35,000,000 by the United States Government for the purchase of aeroplanes, to be used in connection with the army, navy and post office departments, the making of aeroplanes and parts for these will rank as one of the United States' foremost industries. Members of the Motor and Accessory Manufacturers will make quantity production possible for the aeroplane industry.

The following list of exhibitors will show the large number of automobile accessory and parts makers that are entering the aeroplane industry.

## AEROPLANE MANUFACTURERS

(Flying Boats and Balloons)

- Lawrence Lewis Aeroplane Co., Chicago, Ill.
- Aeromarine Plane & Motor Co., Times Bldg., New York.
- The Burgess Co., Marblehead, Mass.
- Curtiss Aeroplane & Motor Co., Buffalo, N. Y.
- Connecticut Aircraft Co., New Haven, Conn.
- John D. Cooper Aeroplane Co., Bridgeport, Conn.
- Christoffersen Aircraft Co., 61 Broadway, New York.
- L. W. F. Engineering Co., College Point, N. Y.
- Samuel S. Pierce Aeroplane Corp., Hampton, L. I.
- Standard Aeroplane Corp., Plainfield, N. Y.
- Sturtevant Aeroplane Co., Jamaica Plains, Mass.
- Thomas Bros. Aeroplane Co., Ithaca, N. Y.
- Wright-Martin Aircraft Co., 60 Broadway, New York.
- Eastern Aeroplane Co., Brooklyn, N. Y.
- Whitteman-Lewis Co., Newark, N. J.
- New Jersey Aeroplane Co., Paterson, N. J.

## MOTOR MANUFACTURERS

- R. J. Collier, New York.
- General Vehicle Co., Long Island City.
- Trebert Motor Co., Rochester, N. Y.
- Aeromarine Plane & Motor Co., New York City.
- Curtiss Aeroplane & Motor Co., Buffalo, N. Y.
- E. F. Sturtevant Co., Jamaica Plains, Mass.
- Thomas Bros. Aeroplane Co., Ithaca, N. Y.
- Wright-Martin Aircraft Co., New York City.
- Packard Motor Car Co., Detroit, Mich.
- Springfield Motors Co., Springfield, Mass.
- Wisconsin Motors Co., Milwaukee, Wis.
- World's Motor Co., Milwaukee, Wis.

## PARTS AND ACCESSORIES, ETC.

- Charles D. Woodward, Providence, R. I.
- Texas Co., New York City.
- Christensen Engineering Co., Milwaukee, Wis.
- Janney-Steinmetz Co., Philadelphia, Pa.
- Stromberg Motor Devices Co., Chicago, Ill.
- Hayes Manufacturing Co., Detroit.
- Clarence Whittman, New York City.
- Dayton Engineering Laboratories, Dayton, Ohio.
- Doehler Die Casting Co., Newark, N. J.
- Vacuum Oil Co., New York City.
- Standard Parts Co., Cleveland, Ohio.
- American Bronze Co., Berwyn, Pa.
- Northeast Electric Co., Rochester, N. Y.

- Sperry Gyroscope Co., Brooklyn, N. Y.
- Abercrombie & Fitch Co., New York City.
- Aluminum Castings Co., Cleveland, Ohio.
- Aviation & Aeronautic Engineering, New York.
- Champion Ignition Co., Toledo, Ohio.
- Du Pont Chemical Co., Wilmington, Del.
- Erie Specialties Co., Erie, Pa.
- Ericsson Mfg. Co., Buffalo, N. Y.
- Goodyear Tire & Rubber Co., Akron, Ohio.
- Herbert & Huesgen, New York City.
- Keasby & Mattison Co., Penn.
- Motor Boating, New York.
- Motor Compressors Co., Newark, N. J.
- Moto-Meter Co., Long Island City, N. Y.
- Radium Chemical Co., Pittsburgh, Pa.
- John A. Roebling's Sons, Trenton, N. J.
- Standard Screw Co., Detroit, Mich.
- Taylor Instrument Co., Rochester, N. Y.
- U. S. Rubber Co., New York City.
- Valentine Varnish Co., New York City.

## GOVERNMENT EXHIBITS

- War Department.
- U. S. Army (including aviation section).
- U. S. Navy.
- Bureau of Standards.
- Weather Bureau.
- U. S. Geodetic Survey.

## Chicago Salon in Congress Hotel

CHICAGO, Jan. 22—Chicago's automobile salon will be held in the Elizabethan room of the Congress Hotel. Nine automobile makers will exhibit: Locomobile, Brewster, White, Simplex, Murray, Daniels, Disbrow, Lancia, Fageol. C. P. Kimball & Co. of Chicago will exhibit body work, showing models of the Marmon and Doble cars.

## Commerce on Exhibition at Chicago

CHICAGO, Jan. 24—The Commerce Motor Car Co., Detroit, will exhibit its trucks during the local automobile show at its dealer's showroom, Commercial Motor Truck Co., 1718 Indiana Avenue.

## Spranger Wheel Changes Name

DETROIT, Jan. 22—The name of the Spranger Rim and Wheel Co. has been changed to the Spranger Wire Wheel Co. and the capital stock has been increased from \$100,000 to \$300,000. The management has been taken over by the following new officers: J. A. Lancaster, H. E. Adams, and J. Roberts. It is planned to increase the output to more than 500 sets of wheels daily and to employ 300 workmen.

## Little Joins Nash Motors

KENOSHA, Wis., Jan. 21—P. G. Little has been appointed chief inspector of the Nash Motors Co. Little was a motor truck inspector for the French Government at the beginning of the war.

## National Acme Plans Dividend Action

CLEVELAND, Jan. 22—It has been predicted by high authority, that the annual meeting of the stockholders of the National Acme Co., which will be held late this week, will witness an increase of directors, an arrangement for quarterly dividends of 6 per cent to be paid beginning in March, and the approval of plans for construction of new buildings amounting to 6 acres of floorspace. The company has had profits for the past year amounting to about \$6,000,000.

# North American Merger

## Manufacturer of Gasoline Motors Buys Out Two Competing Companies

PHILADELPHIA, Jan. 18—The North American Motors Co., Pottstown, Pa., which was incorporated last November to manufacture gasoline motors for automobiles and for general machine work, has bought the assets of the Potter Mackie Mfg. Co., with a factory in Pottstown, and the North American Motor Co., a partnership manufacturing gasoline motors.

Edmund J. Levine, president of the Fibroid, New York, has been elected president of the North American Motors Co. S. C. Potter of Pottstown was elected vice-president; G. C. Lees, secretary, and treasurer, and F. W. Fahringer, assistant treasurer.

This spring and early summer it expects to build a plant on a 4-acre plot which it has bought on Queen Street, Pottstown, which will be suitable for its work, the manufacture of 45, 30 and 20-hp. motors, formerly under the name of Hazard, for commercial vehicles.

## Hayes Mfg. Stock on Sale

DETROIT, Jan. 22—The stock of the Hayes Mfg. Co., which recently increased its capital, is being offered for sale. The stock offered amounts to \$625,000 and is the new issue, the concern now being capitalized at \$1,500,000. The dividend rate is 12 per cent, payable quarterly.

The business of the company has increased from \$750,000 to \$3,500,000 within the past 2½ years, and net earnings applicable for dividends have increased from \$103,760 for the fiscal year ending June 30, 1915, to \$280,000 for the same period ending June 30, 1916.

## Acme Truck Elects Directors

CADILLAC, MICH., Jan. 22—At the annual meeting of the Cadillac Auto Truck Co. the following men were elected directors: W. A. Kyser, C. J. Helm, John P. Wilcox, F. O. Gaffney, Henry Ballou, Henry Knowlton, Perry F. Powers, J. C. Ford and D. E. McMullan. Secretary Helm's report showed more than 200 trucks had been made and shipped during the company's first year.

## Wolverine Tractor Stock on Market

DETROIT, Jan. 20—The Wolverine Tractor Co., Wayne, Mich., is now selling its stock to the public, following permission by the State Securities Commission. The concern has been assembling machines in its plant at the Prouty & Glass factory since last summer.

# \$18,306,429 Firestone Surplus

**\$325,490 Cash on Hand Shown in a Statement as of Oct. 31, 1916**

AKRON, Jan. 23—The balance sheet of the Firestone Tire & Rubber Co., as of Oct. 31, 1916, shows cash amounting to \$325,490; notes and receivable, \$6,820,632; inventory, \$9,715,949; notes payable, \$5,245,843; accounts payable, \$1,671,305; surplus, \$18,306,429, and total assets and liabilities, \$34,360,848.

The Firestone Tire & Rubber Co.'s consolidated balance sheet as of Oct. 31, 1916, is as follows:

ASSETS	
Real estate and plant.....	\$10,687,963
Investments in securities.....	647,923
Inventory.....	9,715,950
Subscriptions of pfd. 6% cumulative stock.....	5,008,775
Cash.....	325,490
Notes and accounts receivable.....	6,829,632
Due from employes' account stock bought.....	1,107,083
Reserve for future operations.....	38,032
<b>Total.....</b>	<b>\$34,360,848</b>
LIABILITIES	
Preferred 6% cumulative stock.....	\$5,000,000
Common stock.....	8,000,000
Notes payable.....	5,245,844
Accounts payable.....	1,271,305
Taxes, interest, wages, etc.....	386,852
Welfare and pension reserve.....	1,000,000
Insurance reserve.....	150,418
Surplus.....	18,306,429
<b>Total.....</b>	<b>\$34,360,848</b>

### Leather Tire Goods Changes Name

NIAGARA FALLS, Jan. 22—Woodworth Mfg. Co. is the new name of the Leather Tire Goods Co., which has been taken over in its entirety by this new company. The Woodworth company will carry on the business without change. There is no change in the personnel of the company.

### J. W. Murray Doubles Capital

DETROIT, Jan. 19—The J. W. Murray Mfg. Co., this city, maker of sheet-metal parts for automobiles, has increased its capital from \$500,000 to \$1,000,000, to be taken care of by a 100 per cent stock dividend.

The new issue will be placed on a 16 per cent yearly cash basis, payable 4 per cent quarterly. This follows the company's recent statement of net earnings for the year 1916 of upward of \$240,000.

The company has recently added extensively to its factory, which will enable it to about double its output.

The following compose the board of directors: J. W. Murray, president; L. G. Schwartz, vice-president; J. R. Murray, secretary and treasurer; William Blanck, F. G. Schwartz, Andrew Murray and Edward Stephens.

### Gier Increases to \$1,000,000

LANSING, MICH., Jan. 20—The Gier Pressed Steel Co. has increased its capital from \$500,000 to \$1,000,000, at a meeting of stockholders held this week. Officers elected were: W. K. Prudden, president; H. F. Bradner, vice-president; B. S. Gier, secretary and general manager; D. F. Edwards, treasurer. These officers and L. F. Price, E. Verlinden, H. F. Harper and W. H. Newbrough form the board of directors. A 25 per cent stock dividend was authorized.

The business of the company was 50 per cent greater for 1916 as compared with that of 1915. Among the concerns placing orders with the company are the Auto Body Co., Olds Motor Co., Auto Wheel Co., and the Reo Motor Car Co.

### Tubeless Tire Increases Capital

MILLERSBURG, OHIO, Jan. 21—The Tubeless Tire & Rubber Co. has increased its capital from \$75,000 to \$1,000,000.

### Continental Transfer Involves \$1,920,000

DETROIT, Jan. 23—Distribution of \$1,920,000 in cash and 200 per cent in stock dividends was made available to stockholders of the Continental Motors Co. to-day, the date for the exchange of the new stock for old under the recently announced reorganization plans.

The transfer of stock provides for a 50 per cent cash dividend and the exchange of three shares of the new stock for each share of old, the new stock having a par value of \$10.

# Gasoline Prices Are Still Higher

**All Sections of United States Are Affected by New Rate Increase**

NEW YORK, Jan. 19—Further increases are reported from different sections of the country this week, ranging from 1 to 5 cents. The rapid advance in crude oil has been responsible. Pennsylvania crude is now selling at \$3.05 per barrel.

The Atlantic Refining Co. has raised prices 2 to 5 cents a gallon in Pennsylvania. In the future the three automobile grades will be as follows: 68-70, 26 cents; 70-73, 29 cents, and 73-76, 33 cents.

The Texas Co. has made an advance of 1 cent a gallon in the South. The following are the new maximum and minimum prices: Maryland, 22-21 cents a gallon; Virginia, 23½-21½; North Carolina, 24-22; Georgia, 26-23½; Florida, 25½-23; Alabama, 27-23½, and Oklahoma, 23, tank-wagon basis.

The Standard Oil Co. has advanced prices 1 cent, to 24 cents, in Boston. The price has been 23 cents since Aug. 11.

The third increase in gasoline prices in the Milwaukee district since Jan. 1 was made Jan. 17, when ½ cent was added to the entire list. On Jan. 3 prices were raised 1 cent, and on Jan. 9 the low grade fuel was advanced 1 cent. The cheapest gasoline now sells for 21 cents per gallon at filling station and 20 cents tank wagon basis.

Gasoline prices have been advanced 1 cent a gal. in the following States. The net maximum and minimum prices are: Colorado, 26, 23; Montana 25½, 24; New Mexico 26, 22; and Wyoming, 24, 20½.

### Steel and Copper Higher

NEW YORK, Jan. 24—Prices of automobile materials last week were generally higher, especially in the metals and oils. Copper rose to 30½ cents a pound, a gain of 1½ cents, and Bessemer and open-hearth steel reached the \$65 mark per ton, a new high. Notwithstanding reports that rubber prices would be affected by the German shipping raids, rubber prices have remained constant, with Para going down to 76½, a drop of 1 cent a pound. Ceylon grade fluctuated throughout the week, its highest quotation being 80 and its lowest 77.

### Change in Hydraulic Steel Refinancing

CLEVELAND, Nov. 27—Since the announcement last November of the formation of a \$10,000,000 company, to include the Hydraulic Pressed Steel Co. and the Cleveland Welding & Manufacturing Co..

## Daily Market Reports for the Past Week

Material	Tues.	Wed.	Thurs.	Fri.	Sat.	Mon.	Week's Changes
Aluminum, lb.	.58	.57	.57	.57	.57	.56	-.02
Antimony, lb.	.14½	.14½	.15	.15	.15	.15½	+.01
Beams & Channels, 100 lbs.	3.62	3.62	3.62	3.62	3.62	3.62	...
Bessemer Steel, ton	60.00	60.00	65.00	65.00	65.00	65.00	+5.00
Copper, Elec., lb.	.29	.29½	.29½	.29½	.29½	.30½	+.01½
Copper, Lake, lb.	.29	.29½	.29½	.29½	.29½	.30½	+.01½
Cottonseed Oil, bbl.	12.20	12.30	12.40	12.60	12.40	12.70	+.50
Fish Oil, Menhaden, Brown, gal.	.73	.73	.73	.73	.73	.73	...
Gasoline, Auto, bbl.	.22	.22	.22	.22	.22	.22	...
Lard Oil, prime, gal.	1.30	1.30	1.35	1.35	1.35	1.35	+.05
Lead, 100 lbs.	7.70	7.70	7.80	7.80	7.80	7.80	+.10
Linseed Oil, gal.	.93	.93	.95	.95	.95	.95	+.02
Open-Hearth Steel, ton	60.00	60.00	65.00	65.00	65.00	65.00	+5.00
Petroleum, bbl., Kan., crude	1.70	1.70	1.70	1.70	1.70	1.70	...
Petroleum, bbl., Pa., crude	3.05	3.05	3.05	3.05	3.05	3.05	...
Rapeseed Oil, refined, gal.	1.00	1.00	1.00	1.00	1.00	1.00	...
Rubber, Fine Up-River, Para, lb.	.77½	.77½	.77½	.77½	.77½	.76½	-.01
Rubber, Ceylon, First Latex, lb.	.77	.80	.80	.79	.78	.77	...
Sulphuric Acid, 60 Baume, gal.	1.50	1.50	1.50	1.50	1.50	1.50	...
Tin, 100 lb.	44.50	45.00	45.00	45.50	45.50	45.50	+1.00
Tire Scrap, lb.	.06½	.06½	.06½	.06½	.06½	.06½	...

there has been much delay in the final negotiations being put through.

The original scope of the refinancing plans, it seems, has been broadened. J. H. Foster, vice-president and general manager of the Hydraulic company, is renewing options on stock of the Cleveland companies on the following terms: The same price for the stock as in the original terms, 270, but instead of 40 per cent of the price being paid in cash and 60 per cent in stock, it is now planned to pay 25 per cent cash and 75 stock.

**To Organize Liberty Body Co.**

DETROIT, Jan. 21—The Liberty Body Co. is being organized in Detroit to make commercial bodies. Prominent men of the industry are said to be interested.

**Dividends Declared**

Kelsey Wheel Co., quarterly of \$1.75 a share on preferred, payable Feb. 1 to stock of record Jan. 16.

Stewart-Warner Speedometer Co., quarterly of 1½ per cent, payable Feb. 15 to stock of record Jan. 30.

**100 per Cent Stock Dividend for Bower**

DETROIT, Jan. 23—The Bower Roller Bearing Co. has declared a stock dividend of 100 per cent and a cash dividend of 15 per cent, payable to stock of record Jan. 18.

**Hoover Declares Dividend**

DETROIT, Jan. 21—The Hoover Steel Ball Co. declared a 5 per cent monthly dividend payable Feb. 1 to stockholders of record on Jan. 22.

**Automobile Issues Stronger**

**General Motors, Chevrolet and United Motors Make Substantial Gains**

NEW YORK, Jan. 24—The automobile and accessory securities last week were featured by a general increase in prices. Automobile issues were exceptionally strong. The old stock of General Motors rose to 750, a gain of 250 points, Chevrolet rose 13 points to 115 and United Motors rose to 47¼, a gain of 6¼ points.

Firestone common recorded a drop of 8 points, Fisk dropped 5 points and Portage 4 points. Whether or not these declines were due to the activities of the German raider is not known, but it is stated that these shipping raids have affected rubber supplies.

Favorable rumors have been made from Wall Street in regard to the motor issues. For instance, United Motors has seen excellent buying on account of the statement that its earnings are running close to \$15 a share. Maxwell stock started upward last week. Rumors had it that its sales and deliveries of cars are far ahead of what they were a year ago. The Maxwell company, it is stated, has covered its steel requirements for this year at prices far below the present level.

Goodrich stock is stronger on account of the coming stockholders' meeting when it is expected that Goodrich will show earnings equal to 13 per cent for the com-

mon. Though this would compare with 17 per cent in the 1915 year, the 1916 sales are estimated at \$73,000,000, a gain of 30 per cent.

Yesterday the stock market was governed by conflicting influences all through the day. President Wilson's speech seemed to improve prices, a rally taking place following the announcement of the speech.

The recent readjustment of the capitalization of the International Motors Co. has resulted in a big improvement in the company's working capital. Orders on hand at the beginning of 1917 were larger than 1916 and the output for this year is expected to reach at least 3000 trucks. The common stock as a result of this favorable report rose 2 points to 18.

**National Earnings for 1917 Estimated at \$1,000,000**

INDIANAPOLIS, Jan. 23—The National Motor Car Co., this city, is largely oversold this year. The demand is far in excess of the capacity. Earnings for the year ending Nov. 30, are estimated at about \$1,000,000 or equivalent to \$12.50 per share on the 80,000 shares of stock outstanding. This compares with net of \$425,000 for the last year of the old company, or \$5.30 per share.

**N. Y. Pullman in Receivers' Hands**

NEW YORK, Jan. 20—William A. Keyworth, Carlton L. Hoff and Henry Schmidt, who were recently appointed receivers of the York Motor Car company, York, Pa., by the York county courts were appointed receivers this

**Automobile Securities Quotations on the New York and Detroit Exchanges**

	Bid	Asked	Net Ch'ge		Bid	Asked	Net Ch'ge
Ajax Rubber Co.	72½	74	+2¼	Standard Motor Construction Co.	5½	6½	..
J. I. Case T. M. Co. pfd.	85	88	-1½	Stewart-Warner Speed. Corp. com.	99	100	- ½
Chalmers Motor Co. com.	25	30	-5	*Studebaker Corp. com.	108	108½	+3½
Chalmers Motor Co. pfd.	..	..	..	*Studebaker Corp. pfd.	108½	110½	..
*Chandler Motor Car Co.	99	102	+1½	Swinehart Tire & Rubber Co.	84	87	+6
Chevrolet Motor Co.	115	125	+13	United Motors Corp.	47¼	47½	+6¼
Fisher Body Corp. com.	37	40	- ½	*U. S. Rubber Co. com.	60½	60½	+1
Fisher Body Corp. pfd.	94	98	+14	*U. S. Rubber Co. pfd.	110¼	111	+1½
Fisk Rubber Co. com.	75	85	-5	White Motor Co.	51	51½	+2
Fisk Rubber Co. 1st pfd.	110	115	..	*Willys-Overland Co. com.	36½	36¾	+ ¾
Fisk Rubber Co. 2d pfd.	90	100	..	*Willys-Overland Co. pfd.	97½	98½	+1
Firestone Tire & Rubber Co. com.	140	145	-8				
Firestone Tire & Rubber Co. pfd.	107	108½	+1				
*General Motors Co. com.	750	..	+250				
*General Motors Co. pfd.	120	125	+1				
*B. F. Goodrich Co. com.	60	61	+4¾				
*B. F. Goodrich Co. pfd.	110½	112	..				
Goodyear Tire & Rubber Co. com.	278	282½	-2				
Goodyear Tire & Rubber Co. pfd.	107½	108½	+ ½				
Grant Motor Car Corp.	7	9	+2				
Hupp Motor Car Corp. com.	3	4	..				
Hupp Motor Car Corp. pfd.	..	..	..				
International Motor Co. com.	18	20	+2				
International Motor Co. 1st pfd.	68	75	..				
International Motor Co. 2d pfd.	25	35	..				
Kelly-Springfield Tire Co. com.	59	60	+2				
*Kelly-Springfield Tire Co. 1st pfd.	92½	95	+2½				
*Lee Rubber & Tire Corp.	23	23½	..				
*Maxwell Motor Co. com.	58½	58¾	+4¾				
*Maxwell Motor Co. 1st pfd.	71¾	73½	+ ¾				
*Maxwell Motor Co. 2d pfd.	38½	39¾	+2½				
Miller Rubber Co. com.	248	255	+1				
Miller Rubber Co. pfd.	107½	108½	+1½				
Paekard Motor Car Co. com.	165	170	..				
Paekard Motor Car Co. pfd.	100½	103	-1				
Paige-Detroit Motor Car Co.	40¼	41¼	+ ½				
Peerless Truck & Motor Corp.	17	20	+1				
Portage Rubber Co. com.	164	166	-4				
Regal Motor Car Co. pfd.	..	35	..				
Reo Motor Truck Co.	..	..	..				
Reo Motor Car Co.	38¾	39½	+1½				
Saxon Motor Car Corp.	64	67	..				
Springfield Body Corp. com.	..	..	..				
Springfield Body Corp. pfd.	..	..	..				

\*At close Jan. 22, 1917. Listed New York Stock Exchange. Quotations by John Burnham & Co.

**OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE**

**ACTIVE STOCKS**

	Bid	Asked	Net Ch'ge
Auto Body Co.	..	45½	..
Chalmers Motor Co. com.	..	..	..
Chalmers Motor Co. pfd.	..	..	..
Continental Motor Co. com.	..	38¼	..
Continental Motor Co. pfd. (new)	99½	..	+90
Ford Motor Co. of Canada.	260	263	+10
General Motors Co. com.	..	..	..
General Motors Co. pfd.	..	..	..
Maxwell Motor Co. com.	57	59	+7
Maxwell Motor Co. 1st pfd.	..	..	..
Maxwell Motor Co. 2d pfd.	..	..	..
Paekard Motor Car Co. com.	..	166	..
Paekard Motor Car Co. pfd.	..	..	..
Paige-Detroit Motor Car Co.	40¼	41¼	+1½
W. K. Prudden Co.	49¼	51	- ½
Reo Motor Car Co.	38¾	39	+1½
Studebaker Corp. com.	108	109	+5
Studebaker Corp. pfd.	..	..	..
C. M. Hall Lamp Co.	..	31	..

**INACTIVE STOCKS**

Atlas Drop Forge Co.	35½	38½	..
Kelsey Wheel Co.	50	54	..
Regal Motor Car Co. pfd.	..	35	..

week for the local property of the company by Judge A. N. Hand, in the Federal Court, and were authorized to continue the business of the concern at the branch at 1892 Broadway. The New York branch in 1916 sold 677 automobiles, valued at \$455,000.

#### N. Y. Mitchell Enlarges Scope

NEW YORK, Jan. 22—The Mitchell Motor Car Co., this city, has taken over the entire wholesale, as well as the retail, distribution of Mitchell cars in the Eastern territory. This includes Manhattan, Brooklyn, Long Island, a large part of New York, all of New Jersey and parts of Massachusetts, Connecticut, Delaware and Maryland.

#### Hammond Goes to Cleveland

CLEVELAND, OHIO, Jan. 20—F. N. Hammond, recently branch manager at Youngstown, Ohio, has been made branch manager at Cleveland, succeeding R. S. Hartzell, who has been placed in charge of manufacturers' business in Cleveland and vicinity under the jurisdiction of the Detroit district office. Hartzell's headquarters will continue at Cleveland.

#### Kaufman Joins N. Y. Jobber

NEW YORK, Jan. 20—Carl Kaufman, prominent in the automobile accessory business in this city, has joined the Auto Hardware & Equipment Co., this city, as general manager. This company, which is a large jobber, will move from its present location in Warren Street to 256 West Fifty-fifth Street.

#### McKay With Michigan Electric

DETROIT, Jan. 21—David McKay has become the Michigan sales representative for the Michigan Electric Welding Co., a member of the Steel Products Co.

#### Dimond Handling Detroit

NEW YORK, Jan. 22—Dimond Motor Car Co., 1860 Broadway, has taken on the distribution of the Detroit for the metropolitan district, New Jersey, and New York State up to Albany.

#### New Stearns-Knight Toledo Agency

TOLEDO, Jan. 21—The firm of Nickels, Jackson & Lavenberg has been formed here, to handle the agency for the Stearns-Knight cars. The company was incorporated for \$25,000.

#### Farnham Joining Gibson-Hollister

JAMAICA PLAIN, MASS., Jan. 20—Frank R. Farnham has been appointed director of sales and advertising for the Gibson-Hollister Co., this city. Formerly he was associated with the McGraw Publishing Co., New York.

## Alley To Race Chicago Six

### Will Appear First at Indianapolis Race—Speedway for Salt Lake

CHICAGO, Jan. 18—Tom Alley will drive a Chicago Six during 1917 and will make his first appearance with the new mount at the Memorial day race, Indianapolis. Alley is now building the car for the Pan-American Motors Co., and is fitting one of Harry Miller's new aluminum engines, similar to the one with which Barney Oldfield will campaign his Delage. This engine has aluminum cylinder jackets and is so arranged that by slipping sleeves of different size inside the jackets the cylinder bore can be altered to conform with the piston displacement limit of different races throughout the season. The change from a 450-in. engine to 300-in. engine can be made in about 2 hr. The engine also has a feature that all water and oil leads are within the cylinder casting.

Miller is building six of these engines, one or two of which Oldfield will have, and one goes to Alley. Miller also is building a twelve-cylinder aviation engine along the same lines which Oldfield may use in exhibition and time record work.

#### 2-Mile Speedway for Salt Lake City

SALT LAKE CITY, UTAH., Jan. 23—An automobile speedway is being planned for this city. It will be built on the Bamberger tract, immediately north of Beck's hot springs, costing \$300,000. The Salt Lake Speedway Assn. has filed articles of association.

It proposes building a 2-mile board track 50 ft. wide on the straightaway and 75 ft. wide on banked turns. Seating capacity will be for 30,000. The speedway is expected to be finished by Sept. 1.

#### Rickenbacher Detained by British

CHICAGO, Jan. 18—Predictions that E. V. Rickenbacher's surname would get him into trouble with the Allies on his trip to Europe in his search for a racing mount for Indianapolis interests were proving true in a letter just received. Rickenbacher writes he was detained several days at Liverpool by the authorities, who thought he might be a German spy. He was released after a few days and has gone on to Paris.

#### U. S. To Test Hydro Automobile

CANTON, OHIO, Jan. 20—The Hydro Motor Car Co., incorporated for \$100,000 will begin at once the construction of hydro automobiles; preliminary tests

are to be held before government experts in February.

The car is designed to run backward on water by means of special propellers. When land is reached the land wheels take a firm grip. A feature of the car is that it can be used as an armored machine either on land or water. R. E. Hay, J. P. Snider, H. O. Myers, H. N. Pattison and E. N. Kautz, are the incorporators.

The manufacturers of the car claim they have the assurance of contracts from the government if all tests are satisfactory.

#### Diamond T Truck on Test Trip

CHICAGO, Jan. 22—A 2-ton truck with capacity load has been sent by C. A. Tilt, president of the Diamond T Truck Co., on a trip from Chicago to Tampa, Fla., over the Dixie Highway. The truck is in charge of Bill Paull and Tom Phillips, Wisconsin woodsmen, who report that the roads are in bad condition. The load consists of spare parts for Hixon & Warder, South Florida distributors of the Diamond T trucks.

#### Larson Builds Large Service Station

NEW YORK, Jan. 19—To meet the demand from his new territory, embracing all the Atlantic Coast States from Connecticut to Georgia, C. H. Larson, president of the Oldsmobile Co. of New York, has started the construction of what will be one of the largest service stations in the East. It is located in West Sixty-fourth Street, near Broadway, and covers a plot 100 by 150 ft. Five floors will contain 70,000 sq. ft. of space.

#### Eschner Buys Winton Branch

ST. PAUL, MINN., Jan. 21—Leroy Eschner has bought the St. Paul branch of the Winton Motor Co. and will carry on the business as a new organization called the Eschner Motor Co. Mr. Eschner was for 4 years manager of the branch. He made the change because it was desirable to add a smaller car to the Winton line, which is not possible under the present Winton branch-house arrangement.

#### Fletcher in Southwest for Mitchell

DETROIT, Jan. 21—H. M. Fletcher has become the district representative in the Southwest for the Mitchell Motors Co., Inc., of Racine, Wis. He was formerly district manager for the Maxwell Motor Co., Inc.

#### Newman Takes on Hal

CLEVELAND, Jan. 19—Harry Newman of Chicago has taken on the selling rights of the Hal. He has formed a new company which will be known as the Harry Newman Co. His territory will cover the middle west.

## 1917 Rules for Canadian Tourists

**24,223 U. S. Cars Enter Provinces in 1916—Ontario Registers 17,282**

TORONTO, ONT., Jan. 20—Strict requirements for the admission of automobiles of non-resident tourists are being made by the Canadian Customs Department. The 1917 rules provide that the American tourist must present his license permit at the Canadian port of entry. This will be accepted if his trip is not to exceed 24 hr. It will be taken by the collector of customs and retained until the owner recrosses the boundary, which he must do at the point of entry.

### Cannot Avoid War Taxes

A bonding certificate will be issued at the port of entry for anyone wishing to remain in the Dominion from 1 to 30 days; and this will be cancelled at any port through which the tourist passes in leaving the country. A guarantee company's bond will be required from anyone desiring to remain in Canada up to 6 months over the 30 day period. The bond will be cancelled at the point where the non-resident motorist leaves, and the cancelled copy must be returned to the port of issue.

Any tourist remaining in the country over the 6 months' period must pay the 35 per cent duty and 7½ per cent war tax on his car. No Ontario license is needed for a period of 21 days for the pleasure cars owned by residents of the eighteen states having a reciprocal agreement with the province. The free period will

probably be extended to 30 days in February. All commercial vehicles or demonstrating models must have individual Ontario licenses.

### 24,223 Enter Canada

During the past year 24,223 tourists' automobiles were admitted from the United States to Ontario and Quebec, according to the reports of the collectors of customs of these provinces. The greatest traffic was at Windsor, across from Detroit, which recorded the passage of 8880 cars. The biggest "drive" was on Labor Day, when more than 1800 cars came into Canada from Detroit. Niagara Falls registered 3489 during the year, Walkerville on the Detroit River 2592, Bridgeburg opposite Buffalo 1917, and Lacolle, Que., 3020. The total for Quebec during 1916 was 6941, or more than double the year before.

In Ontario the totals of incoming tourists' cars for the past 3 years were: 1916, 17,282; 1915, 5685; 1914, 6403.

### McMartin Is Fisk Branch Manager

BUTTE, MONT., Jan. 20—E. T. McMartin has been made branch manager of the new Fisk Rubber Co. district which includes Butte, Salt Lake City, Minot and Bismark.

### Apelco Is Starting System Name

NEW YORK, Jan. 22—In the list of car specifications appearing in THE AUTOMOBILE for Jan. 4, the Apelco electric system, manufactured by the Apple Electric Co., Newark, N. J., was incorrectly given as the Apple. No starting system was ever manufactured under the latter name.

## Rope Tire Used in Australia

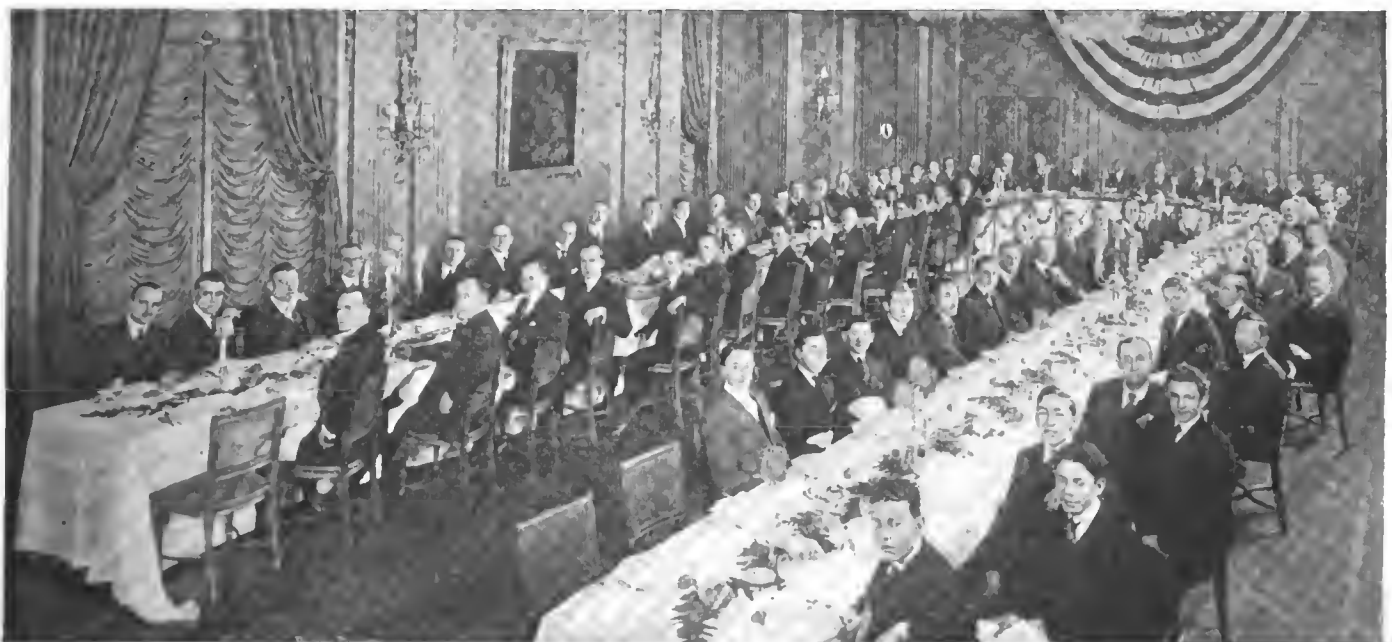
**Puncture Proof Construction Takes Place of Inner Tube and Cover**

NEW YORK, Jan. 22—A rope automobile tire made of coir fibre and bullet, nail and glass proof has appeared in Australia. The advent of the automobile in Australia has, to a very considerable extent, solved the difficulties of transportation. In many parts of the country the roads are merely bush tracks or overland stock routes. The rough nature of the country over which the cars travel and the excessive heat often experienced have made the cost of rubber tires a serious item in maintenance.

As a result many experiments were made to obtain a substitute for rubber at a moderate cost. Tests with tires made of various kinds of fiber were made, with the result that coir fiber was found to be the most suitable for the purpose because of its lightness, cheapness, resilience and durability.

When first placed on the market, the homing tire, as it was called, was sold as an emergency tire, in case of puncture or blowout, but it proved so satisfactory that in the country districts of some of the States the rope tires are frequently used on all the wheels. It is claimed that if a speed of 16 m.p.h. is not exceeded they are almost as soft riding as pneumatic tires.

It should be understood that the homing tires take the place of both inner tube and cover, being attached to the rim by four or five straps.



Annual dinner of the united editorial and business staffs of the Class Journal Co., publisher of THE AUTOMOBILE, Motor Age and Motor World, held at the Hotel McAlpin during New York show week





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**Metric Standards**

THE American aviation industry has now to face the decision as to what extent, if any, it will make use of metric standards of measurement. For example, engine designers are calling for a spark plug smaller than the S. A. E. standard; shall it be 1 in. across the hexagon or shall it be 25 mm.? The difference does not matter to the engineer, nor does it matter to him in a way if the thread of the plug is the same as the British standard, 18 mm., or whether it is an inch dimension of approximately the same size. That is to say, interchangeability with the European plug does not bother the engineer.

But it does bother the men who have to use the engines, and they are beginning to ask for the British plug thread and the French millimeter propeller mounting standard. There is an idea abroad that the government authorities are anxious to encourage the use of the millimeter as the standard of dimension throughout their aircraft.

**Use the Millimeter**

That the wise thing to do is to adopt the millimeter admits of much argument, but there can be only one ultimate answer and that is an affirmative. Ultimately the whole world *must come to one standard of measurement* and one standard in many other things. Suppose that the Illinois dollar was worth 98 cents in New York, 102.5 cents in Michigan currency, and something else in California; think of the appalling muddle and waste of time that would

result. It is unthinkable, yet the nations of the earth are not so far apart as were New York and Illinois a hundred years ago.

That England must come to the metric standard of measurement soon is now admitted. England has stood aloof from all Continental standardization, has watched all the other nations of Europe come to a common understanding, and watched *unmoved* till the automobile industry sprang into being. The British automobile trade is divided, some using the inch and some the millimeter, though most the latter. All tires are millimeter sizes in England and have been for years; all engines for aircraft almost without exception are built throughout to millimeters. Recently the most noticeable change is that tolerances are beginning to be stated in metric. For a long time after using metric main dimensions the tolerances were still quoted in inch thousandths, and all British makers stick to feet and inches for specifying wheelbase. Thus the British industry is in a confused condition between two standards.

**America Left Alone**

That England could hold out so long against the pressure of France and Germany and Italy was due to two things. The most important was the colonial market which thought in inches with the greater facility, the other was the attitude of America. Thus we have seen America and England invading the British Empire, and leaving the South American countries and other places to Continental Europe. It is not a language question. French and German are not spoken a great deal in South America. Your German must learn his South American tongue just as much as your American.

As soon as England breaks away from tradition and goes to metric standards America will be left alone in the world and America's commerce will be hampered in all engineering exportation by the use of a standard of measurement unknown anywhere else in the world. It cannot be allowed. Whatever may seem to be the state now, whatever may be the cost of making the change, it will have to be done, and every day it is postponed the more costly it will be. To set, say, 1930 or 1940 as the change-over year would cost America far less than adherence to the inch is going to cost her before 1925 is done.

A number of years ago the proposal was made in various quarters of the automobile industry to standardize on the metric system of measurements and considerable discussion was carried on at the time in regard to the advisability of such a movement. Naturally, established companies opposed the idea, since its adoption would entail an enormous expense in alteration of production methods and installation of new machinery, etc.

The opportunity now offered to the aviation industry is to take the first step. As aviation is playing an enormous part in bringing people closer together it is eminently suitable that aviation should show the way to a closer understanding between nation and nation. It is so easy, it costs so little to start a new industry on a metric standard, and a cent invested this way now will be \$1,000 in 20 years

# Body Detail Greatly Improved

Shows Reveal Tendency Toward Graceful Lines, More Tasteful Colors, Better Upholstery—Higher Class Workmanship and Finish—Other Features

By George J. Mercer

**I**N the Palace show, to the general public the body exhibit compared favorably with any previous one. The bodies had deep cushions and thick trimming to insure comfort, the door spaces were roomy, and expensive trimming materials were used on all the best cars. Toilet cases, dome and reading lights, arm rests for the rear seats, regulators for operating the windows and frameless glass windows were common. Brilliant color schemes, showing well-painted surfaces, were the rule, the fenders were effective and of good design, the running boards had sensible shields, and extra tires, mostly carried at the rear, had strong hangers.

The best runabout colors shown, were yellow and black, yellow and brown, a two-tone green, two-tone gray and white and a green with white wire wheels. Touring bodies were mostly in dark colors, of the brighter shades the best were, two-tone gray, coffee and black and yellow and black.

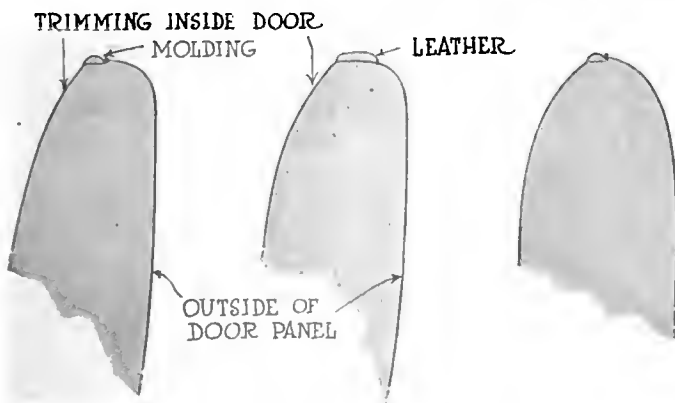
Small closed bodies showed well in blue upper and gray under and in black and gray, with guards to match the dark color. Blue and white and black and white give too sharp a contrast. The large closed bodies looked best painted in two tones of dark blue and relieved with striping. It was noticeable at both shows that striping was more common than heretofore, it is apparently coming back. Striping adds a touch of color to dark shades and is a relief that is always in good taste.

White was used to some extent on closed bodies at the Palace, but in most cases the companion color was a too severe contrast. The sedan and convertible are all-weather bodies, and it was surprising that the two-tone browns and grays were not used more generally for these, as such colors help to make the car look light, which is highly desirable for an all-season vehicle.

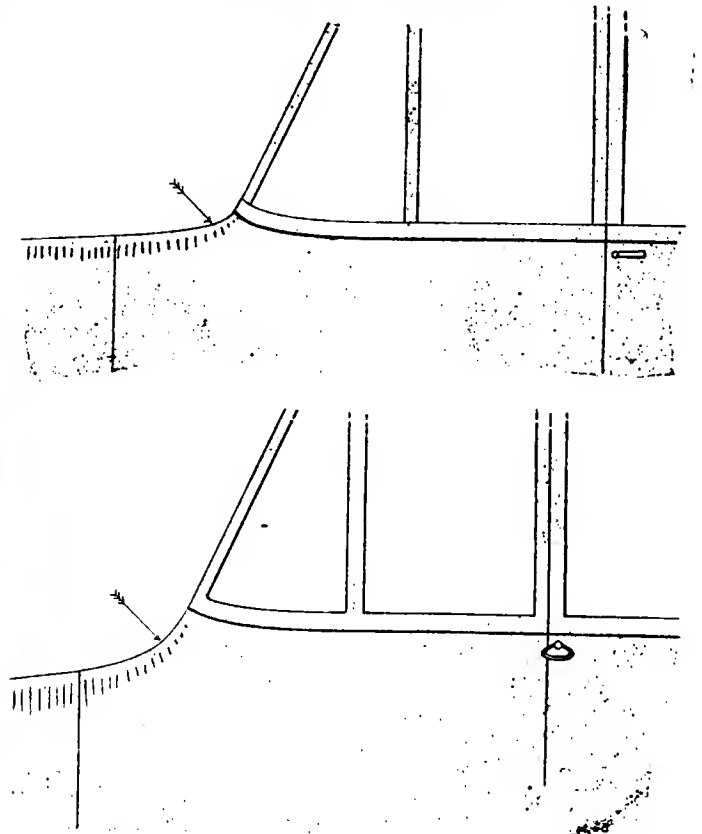
The trimming or upholstery is an important item in a body, more so with a closed than an open one. The latter, on account of being open to the elements, must have the substan-

tial leather or waterproof fabrics and the choice is mainly a question of how these are assembled in the body. With the present style of flush side design for touring and runabout bodies, the large roll of trimming on top of the sides and seat back has disappeared, and the trimming finishes flush with the top edge of the panel. It is more difficult to accomplish a neat finish than formerly and careless workmanship in finishing up the leather edges at the top and around the door openings will detract a great deal from the otherwise good appearance of the body. The best finish shown is illustrated in Fig. 1 in which a metal molding covered with leather is used along the top edge, the doors and door openings being covered by a narrow welt, evenly put on and blind tacked. Fig. 2 shows a finish that does not give a neat appearance, as this small irregular shaped leather roll has a baggy look on top of the metal. Natural wood was used in a few instances and this would not be bad, if it were colored to match the paint or leather; it would then serve its purpose without advertising itself too prominently; strong contrast between the painted and rounded top edge of the body and a cap, either of wood or leather, is inharmonious and not necessary.

Fig. 3 is another sectional view of a door, illustrating the



Above—Fig. 1—Left—Best door trim finish. Fig. 2—Center—Trim which does not appear neat. Fig. 3—Right—Example of overdoing a neat trim. Right—Fig. 4—Above—Hood raised to blend into cowl. Fig. 5—Below—Undesirable result with hood not raised



same position as Figs. 1 and 2. This shows the extreme round to the top edge of the body, and portrays the carrying of a good thing too far. The round top edge is a pleasing design only when used in moderation, and the side line of the body should not be started on the curve until close to the top, while the radius should never exceed 1 in. Many bodies with not more than ¼-in. radius looked very well.

The stitched pleat for back and seat cushions was used a great deal. This is durable and makes a fine trimming design, it presents the full round appearance of the plain trimming without its defect of wearing baggy.

The trimming of the closed bodies presented a variety in color and materials, the best effects being obtained on those bodies that used soft neutral light shades of material. One beautiful design had a figure delicately outlined in the center of each panel, and the trimming design was plain with divided cushion and back, the seat and back being defined by carved wood finish. Elaborate wood finish was used on the doors and front division, the toilet cases were the visible type and of special design, as were also the handles of the regulators and the dome light, this latter projecting lower than customary. The arm holder was replaced by a silk rope hanging inside the hinge pillar. The carpet extended from the line of the bottom of the seat cushion along the sides and doors, and no cord hat-rack was used.

Other suitable trimming materials were those having inconspicuous figures or stripes. In some cases, the figured material was used for seat and back, the sides and roof being plain material and this made a pleasing contrast. Velours were used to some extent, and one in two shades of brown looked well. The tapestry did not look so well, the figures

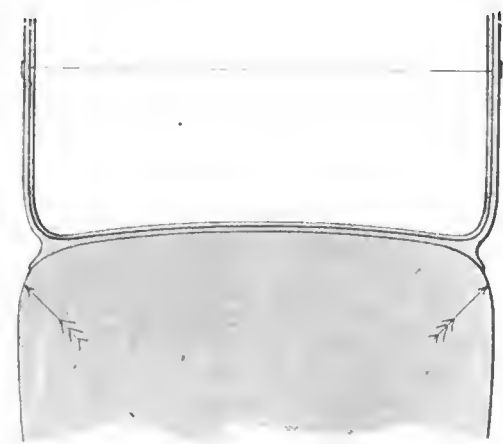
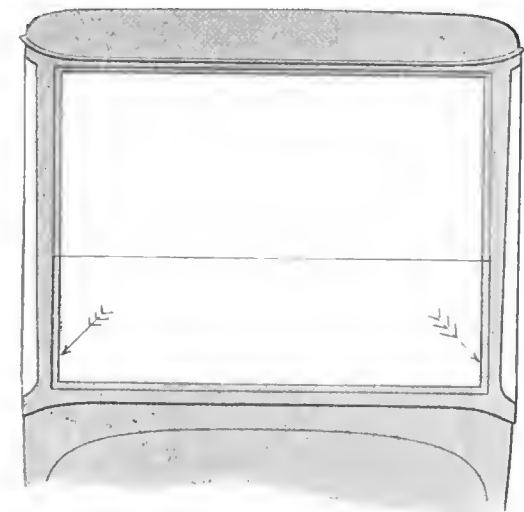
being usually too large to please the eye; large figures on a design for body cloth are not desirable, on account of the confined space and the tendency is to become satiated with the color display.

Concealed toilet cases were used largely, and the dome and reading lights were of the standard pattern on the majority of cars. The extra seats were mostly of the flush folding type. Pillar lamps were not used to any extent, and the cord hat-rack and arm holders seem to be extinct. The front division glass is now one piece and regulators are used on practically all bodies. The rear cushions generally had arm rests shaped to fit their use, without interfering with the seat room. Draped window curtains were used largely, but it is very questionable if they are likely to be continued.

A standard of style in body design is difficult to define, as any standard is to some extent local, but an exhibit as large as the Palace display, gives one an excellent opportunity to compare, and if one body looks more pleasing to the eye than another, it is feasible to dissect the difference in parts that make the one attractive and the other not so; proper consideration, of course, must be given to the sizes that provide the necessary comfort.

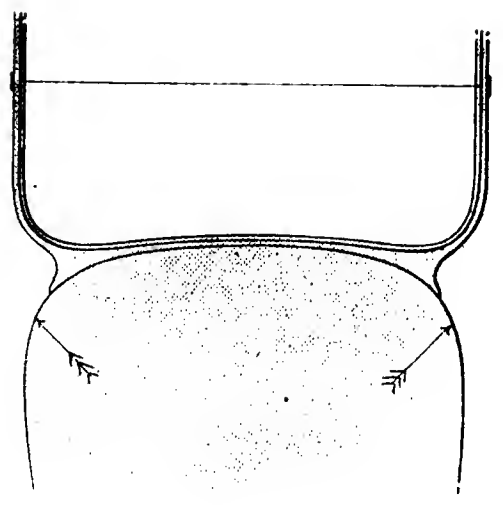
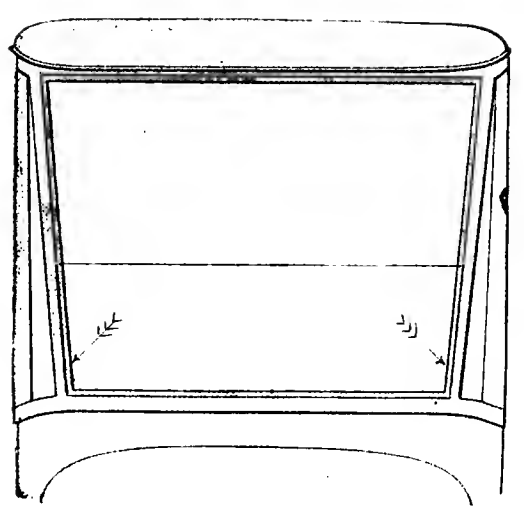
**Improving the Hood Lines**

A concession to the body designer within the last year or so has been the right to alter the size of the engine hood, for without a hood that is sufficiently high and wide at the dash line, a modern body cannot be made to look well. Especially is this true of an inside-drive body of the sedan type with a slanting windshield. On this type of body the line from the radiator back must rise sufficiently, so that a continuation



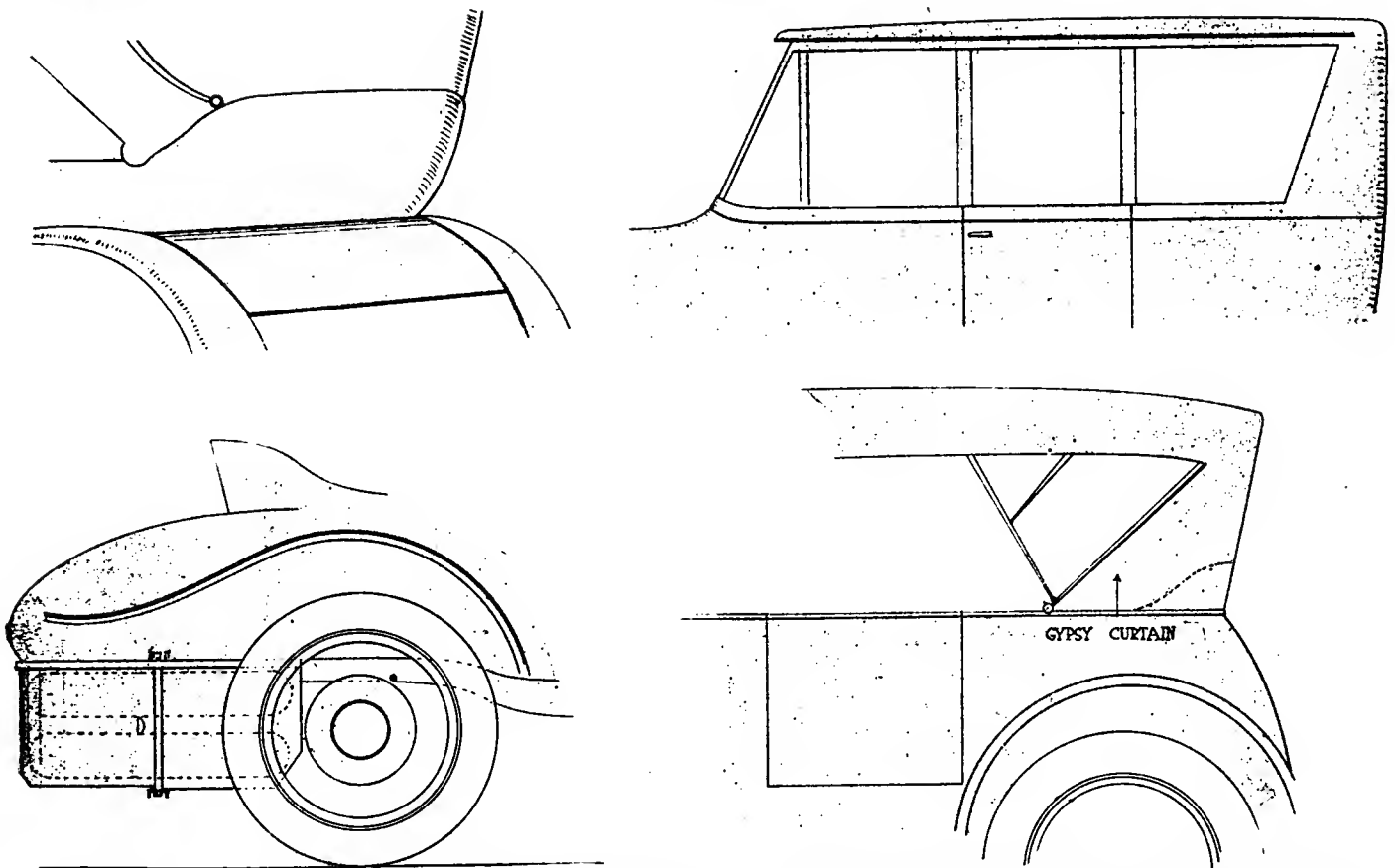
Upper left—Fig. 6—In this type of body the slanting front is kept to vertical lines at the sides with the result that the appearance is harmonious and pleasing

Lower left—Fig. 7—Otherwise similar to the body illustrated in Fig. 6, this type has the slanting front contracted at the top of the cowl line, producing an awkward, misfit sort of effect

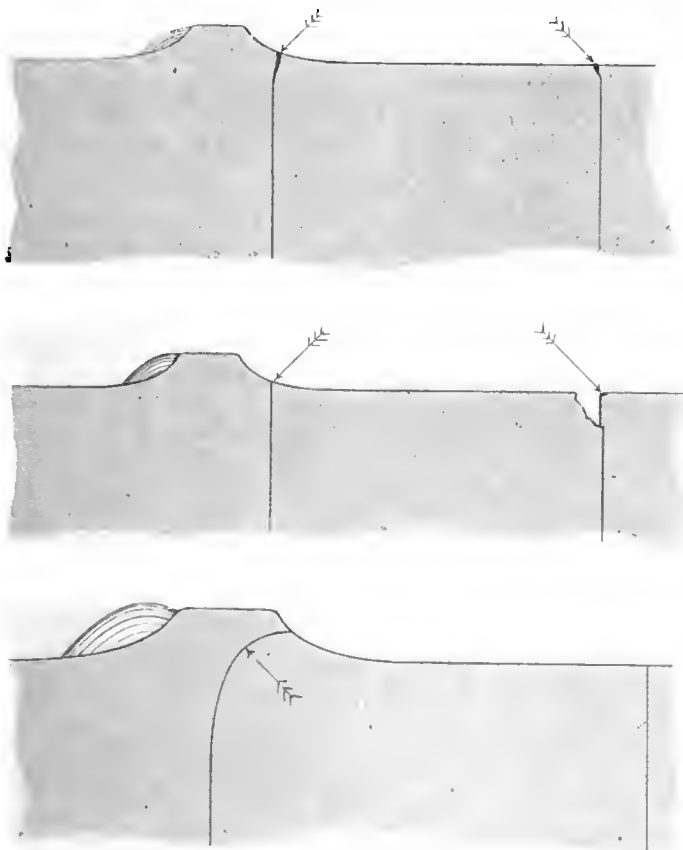


Upper right—Fig. 8—Cowl shaped with a small radius, making a simple, effective design and one which facilitates production at the factory

Lower right—Fig. 9—A case where the cowl is shaped with too wide a radius, making the windshield appear too wide for its base and also complicating manufacture by necessitating a twist in the front door, entailing both greater expense and a less satisfactory result



Upper left—Fig. 13—A well designed stern on one of the cars shown. Lower left—Fig. 14—An innovation in carrying spare tires which combines neatness with space economy. Upper right—Fig. 15—One of the latest types of convertible body, showing the flat roof lines. Lower right—Fig. 16—Use of the gypsy curtain to prevent the rear seat from interfering with the straight-line effect



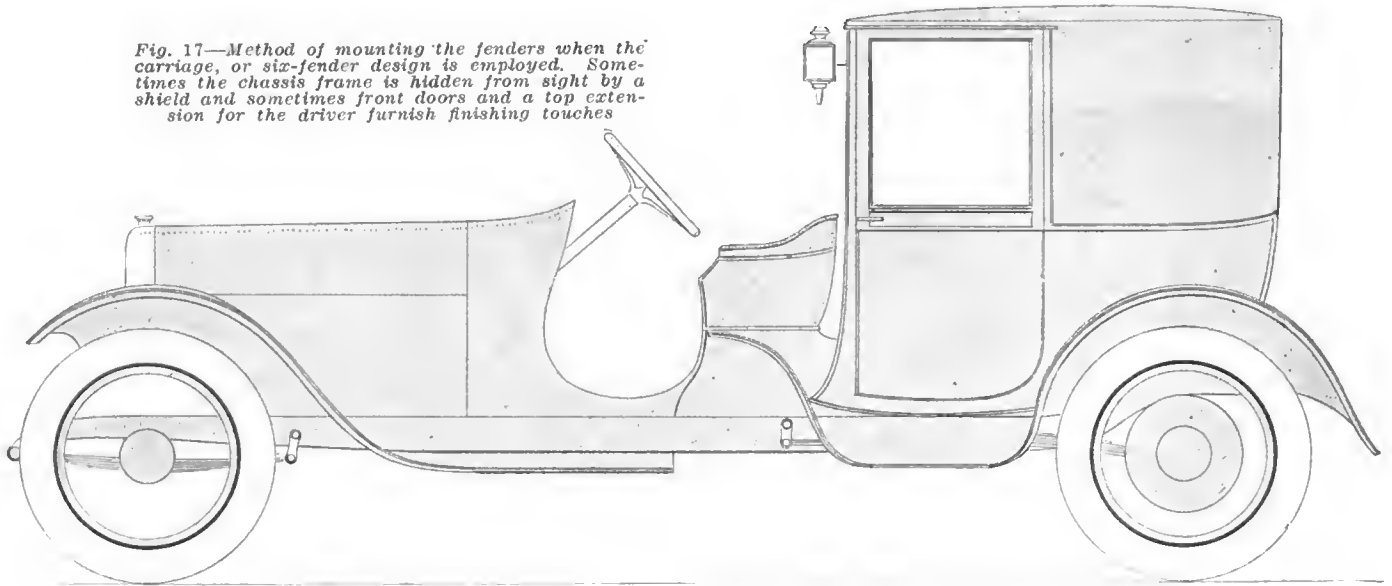
Upper—Fig. 10—Example of a poor ending of an overlap door panel. Middle—Fig. 11—How some avoided the faults of Fig. 1 by cutting down the body. Lower—Fig. 12—Showing the error of using a double cowl on a short-wheelbase car. Note how it spoils the door

of this line on the cowl will meet the belt line of the body easily. If the cowl line has a sharp uptilt close to the body it will give the whole car an "up in the air" look that nothing else can overcome. Fig. 4 shows the hood raised to make the pleasing effect and Fig. 5 shows the undesirable result. This type of body shows the contrast more quickly, as the slanting front shortens the cowl, and the uptilt to meet the body must be more severe on account of being made in a shorter length. Also the best looking bodies of this class were those in which the side line of the body blended with the front in a radius just above the point indicated by arrow marks instead of meeting abruptly at an angle. Figs. 6 and 7 illustrate the front views of similar bodies; in Fig. 6 the slanting front is contracted at the bottom while in Fig. 6 the sides are parallel and the appearance is very much better than Fig. 7 in which the lines of the front are not in conformity with the side lines of the body. The idea of a contracted front is bad only when it is extreme; a moderate contraction is often necessary.

Figs. 8 and 9 are two views showing the shape of the cowl at the place of attaching the windshield. In Fig. 8 the cowl is shaped with a small radius indicated by arrow marks, whereas Fig. 9, having the larger radius, the windshield has the appearance of being too wide for the base and, in addition, this shape of cowl will necessitate having a twist or wind in the fore door at the front, making both an expensive and unmechanical construction, as well as not showing as good an appearance as Fig. 8.

Fig. 10 shows the ending of the overlap door panel. In order not to carry the overlap over the top and show an offset top line, the lap is cut off and shows an opening which, if the body had been painted in light colors, would have given the appearance of an irregular dark spot. Other bodies provided for this, as shown in Fig. 11 by cutting down on the body to permit the door lap to be even. Another form to remedy this (not illustrated), was to have the radius of the

Fig. 17—Method of mounting the fenders when the carriage, or six-fender design is employed. Sometimes the chassis frame is hidden from sight by a shield and sometimes front doors and a top extension for the driver furnish finishing touches



top edge of the body very slight, in fact almost a square corner, then the door lap was cut off in line with this edge.

Fig. 12 is a section showing the second cowl when used on a short-wheelbase car, which is a very great mistake. In this case, the door has a very large piece cut off at the top front line; the hinges were also placed on the front, consequently the space was captured both for entrance and exit. The second cowl takes up room beyond the driving seat, and takes away from door space. This latter is one of the most important things in a body and no design should be considered that restricts the door opening. The use of the second cowl is also carried to an extreme on close-coupled runabouts, the disadvantage in this particular being that it carries the side line of the body up at the cowl and gives a higher look to the body than is necessary.

#### Better Stern Designs Than Formerly

There were more good looking stern ends on the runabouts and close coupled bodies than ever before. This extension beyond the seat to cover up the chassis frame, has been a makeshift proposition for a long time past, but at the Palace, there were several well shaped body ends, that were in balance with the rest of the design. Fig. 13 was a very good illustration, in which the guards were nicely attached to the sides, and looking from the side, the guard and stern had the same shape. Fig. 14 was an innovation in carrying the extra tires; the circular case below the frame revolved to permit the putting in and taking out of the tires. The case when revolved back closed the opening and there were no doors to get out of order or be in the way.

The convertible body was well represented in many of the exhibits. This design seems to have resolved itself into two types, the earlier one in which all the windows were lifted out, and the modified type, in which all the windows except the rear side one, drop flush into pockets, and the pillars lift out. On this latter the roof is flatter and makes a better looking job, Fig. 15 illustrating the latest example of this. The roof line had a very moderate drop at front and back on the majority of the bodies and the number of freak designs were few in number.

The Salon was larger in number of cars exhibited than ever before, and the greatest innovation in design was in the open bodies. The close-coupled touring body of the sporting type seems to be the trend in this design. The second cowl had few upholders and the most conspicuous feature was the continuation of the top side line of the body, either straight, or with very little raise around the back; the top meeting this line and concealing the seat top line. The best illustration

was by the use of the gypsy curtain as shown in Fig. 16 wherein is also shown that the back line which extends to the chassis has the reverse direction to the customary body. The concealing of the top of the seat is also carried out on the larger bodies having extra seats. In some cases the rest for the top, when down, was located on the rear guards, when these had the upward slant at their extreme back end. On runabouts this attachment was located on the stern end.

The trimming on the open bodies was mostly plain design, without stitching or pleats, and very thick at the back. On some it did not appear to be high enough to give proper support, this criticism applying mostly to the close coupled bodies; on the regular touring bodies the trimming was stitched and the seating arrangement was excellent.

The principal effort on the part of the exhibitors, seemed to be centered on good workmanship and finish, rather than the making of changes in design. The closed body designs were extremely conservative, and the effort to rehabilitate the carriage features was very marked. The square pattern carriage pillar lamp, the square back corner of the body, the coupé pillar and driving seat of carriage design, as well as carriage fenders with steps were some things that were generally used.

Fig. 17 shows how the fenders are placed when the carriage, or six-fender design, is used. Sometimes the chassis frame is concealed by a shield, but in the majority of cases, they are as illustrated. The small town cars exhibited were exceptionally good, both in design and finish, the majority had fore doors with windshield and detachable top for the protection of the driver. This is undoubtedly the best proposition, the driver has sufficient protection when required, and the design has a completed look, which Fig. 17 lacks for an automobile. The detachable top was the regular waterproof curtain, that can be folded and put under the seat when not in use. The cabriolet was the only folding top town car exhibited, and there were two large folding top bodies, that worked easily and folded low when down. The convertible body also had its place on the line. It was noticeable that the flapper was rarely used on bodies at this exhibit, whereas at the Palace, flappers were used exclusively on convertible and falling top bodies.

#### Door Pillars Lighter on Closed Cars

One pleasing feature at the Salon was the lighter door pillars on closed bodies, that heavy appearance of pillar thickness when the door is open, having been replaced by proportions resembling the carriage door, and the garnish molding inside has become the modest old-fashioned size. Also quite

a number of the extra seats did not fold into pockets, but were visible, against the partition. This has become necessary because the division light is required to fold down flush. The division is made straight, and additional knee room is obtained for the occupants of the extra seats, without having the body any longer. The roofs were made as light looking as possible with the dip front and back very moderate, and leather was used for covering on the majority shown. A number of V-front bodies were at this show, and on all models the single upper glass only was used. The V-front has the disadvantage of not protecting the driver when the two upper glasses are open, as the angle of the front carries both sides away from the center at the bottom, resulting in a wedge-shaped space in the center, which neither glass protects. It makes an attractive looking design, but has had a stubborn fight to attain popular favor. An early experience in the use of the V front was that the glass reflected the side lights from the street, but this has been overcome by tilting the glass back out of the perpendicular about 3 deg.

The doors on many of the bodies had molding and the fenders were, with the exception of those bodies using the six-fender design, of the smooth top type and crowned about  $1\frac{1}{2}$  in. with narrow skirts set in beyond the edge beading.

Some of the six-fender designs were shaped to imitate the effect of the leather fender.

The trimming materials used were principally the medium light colors. Many were plain and some were relieved by in-

conspicuous figures or stripes of a darker shade. One very beautiful material was an almost white background with blue spot figures, the other appointments corresponding in color. Many of the toilet cases were elaborate in shape and with inlaid work, and they were all of the visible type. A large proportion of the closed bodies were trimmed plain without stitching or pleats and with the cushions and backs divided, making three places defined by a line through the cushion and back. Even when the cushions and backs were stitched or had the pipe and point, the balance of the trimming was never elaborate, the doors had a panel effect with cord, to relieve the plainness, and some had pockets, though the majority were without. Roller curtains were the rule, no arm holders or hat racks and very little wood finish on the doors and front. The metal appointments were sterling silver and nickel.

The dome lights were of different design than customary, and in many cases extended lower, also the corner reading lights were more prominently placed on many bodies and were, in a few instances, of the hanging type. The speaking tube was generally used, and a good idea was developed on some of placing the horn for the driver under the cowl, out of sight and, as the open end faced back, the extra distance that the horn is placed away from the driver, is compensated for by there being no wind resistance against it.

The painting was principally dark blues, greens and blacks; a few combined two colors, one light and one dark, but all color schemes were good and striping was generous.

## New Colonial Eight Engine Is Compact

**A** NEW stock eight-cylinder engine is being marketed by the Colonial Motors Co. of Detroit. It is a conventional type of V-engine and has been under development for the past 2 years. A horsepower output on the dynamometer of 62.5 at 2500 r.p.m. is claimed and the manufacturers state the weight as 496 $\frac{3}{4}$  lb. It is a compact design and is particularly featured by the small space it takes up beneath the engine hood.

In accordance with usual V-engine design where side-by-side rods are used, the cylinders are staggered  $1\frac{1}{4}$  in. The engine is an L-head with the cylinders cast in blocks of four. Bore and stroke are 3 by 5 in. The crankcase is a single aluminum casting and includes the bell housing within which any standard clutch can be housed.

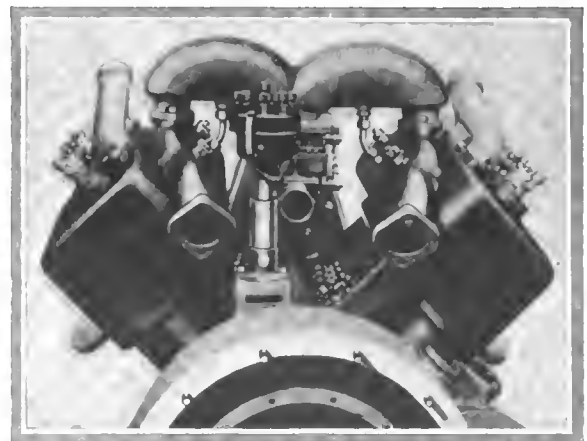
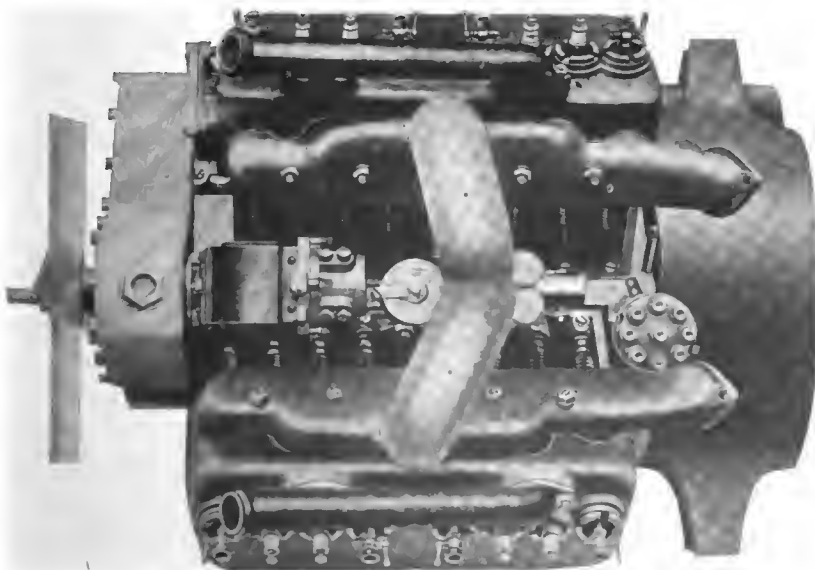
The intake is aluminum and is hot air jacketed to prevent the condensation of the fuel and to actually assist in the complete vaporization of the incoming charge. Cooling is by thermo syphon and with the short engine block considerable space has been found to provide ample waterjacketing space.

The length over all is 32 in. Of this 19 in. is taken up by the cylinder block. The extreme width of the engine is 25 in.

The camshaft, magneto shaft and fan shaft are all driven by silent chains which can be adjusted from the outside while the engine is running. The valves have a diameter of  $1\frac{1}{2}$  in. in the clear and a lift of  $\frac{5}{16}$  in. They are offset at an angle of 7 deg. to secure direct contact on the camshaft without the use of intermediate linkage.

No external leads are used in connection with the oiling system. This is a pressure feed through a hollow crankshaft. The bearing dimensions on the crankshaft are  $1\frac{1}{8}$  in. by 3 in. for the front;  $1\frac{15}{16}$  by  $1\frac{3}{4}$  in. for the center, and 2 by  $3\frac{3}{8}$  in. for the rear. The connecting-rod bearings are 2 in. diameter and  $1\frac{1}{4}$  in. long. The camshaft is also carried on three liberal bearings.

As will be seen from the illustrations there is a simple layout of accessories. These are incorporated in the V, for the larger part and the valves are accessible for adjustment by removing a plate within the center of the cylinder casting.



Two views of the new eight-cylinder Colonial engine. It has a bore of 3 in. and a stroke of 5, and is said to deliver an output of 62.5 hp. on the dynamometer at 2500 r.p.m.

# Foreign Trade Department

## Addresses at N. A. C. C. Export Conference

**T**HE AUTOMOBILE this week presents herewith several of the papers presented at the convention of automobile export men conducted by the National Automobile Chamber of Commerce, Friday, Jan. 12. In our report of this convention last week attention was drawn to the difference of opinion among U. S. A. manufacturers as to whether we should sell the foreigner our automobile as built for home consumption or whether we should alter it to meet the wishes of the foreigner. The arguments of E. W. Davenport favoring selling our car as it exists to-day are set forth in his paper which is among those printed herewith.

Chas. Denby, export manager for Hupp, drew attention to the possibilities of the great Chinese field, a field he considers one of the

most attractive for American export work.

Troubles in connection with shipping are well outlined in the paper of L. V. Hummel, traffic manager of Gaston, Williams & Wigmore.

R. J. Archer, export department of Willys-Overland Co., has tackled the problem of the necessary factory organization for handling export work. He deals with the subject as to whether it is best to have the export department at the factory or located in New York City, where it is close to those concerns handling shipping, marine insurance, etc.

Dr. E. E. Pratt of the Bureau of Foreign and Domestic Commerce in his paper drew attention to the value in any industry of export trade. It has a decided stabilizing influence.

## U. S. A. Cars Should Win Abroad on Own Merits

By Charles Denby

*Export Manager, Hupp Motor Car Corp.*

**T**O the casual observer it would seem that the question, "What is the best method of entering foreign markets?" could be answered readily by giving details of transportation and financing for the guidance of the inquirer. But we in the export trade know better. We know that this is a subject which engages the attention of many thousands of our fellow citizens daily; a problem upon the solution of which we base our hopes for foreign trade.

### Deeper Understanding Required

The problem of how to obtain a footing in foreign markets for articles of American manufacture, in fact, engages the attention of American manufacturers more and more as the home consumption of our raw materials increases and we are more and more driven to look abroad for gain. The American merchant is apt, however, to regard the foreign market, in a general sense, as a natural phenomenon, and he is inclined to consider the problem of approach to it as one to be solved under the broad laws of supply and demand. A not very profound consideration will show that we manufacturers of automobiles require a deeper understanding of foreign countries as markets; that our investigation must be pushed farther than the question, "Is there a demand for my goods in such a market?" The demand itself must be analyzed and all the elements which give rise to it must receive the most careful attention, in order to arrive at a sound conclusion as to the best methods of introducing automobiles in any foreign country.

In the automobile trade we meet a variety of conditions: we meet with competition on the part of foreign factories; competition on the part of manufacturers of our own nationality; we meet a variety of tastes, a wide range of physical conditions, national prejudices, labor problems, legal obstacles. What, then, in general, is the best method for Amer-

ican automobiles to enter foreign markets? And what, to bring the question down to each one of us individually, is the best method for my automobile to enter foreign markets against the difficulties of that market; against the foreign competitors we will meet there, and against the perhaps more dangerous competition which we will meet with from one another?

A part of this investigation we export managers can make together, assured that identity of interests will bring no conflict. We can consider foreign markets, in fact, side by side. It is possible that at a certain point we will begin to part company. We of the Hupmobile may find that we fear you of the Dodge; of the Studebaker; of the Chevrolet; of the Maxwell, Chalmers, etc., and the many other makers of American cars, who feel, as confidently as we do, that the foreign market is your proper goal. I think, however, we will gain more than we will lose by an exchange of views. Let us see whether, as Americans, not as representatives of particular factories, we cannot reach such a common ground, on which we can stand together and find that we can better face the foreign market united than divided.

### Three Men Involved

The Chinese have a proverb: "San jen tung hsin hwang tucheng chin," which means that if three men are of one mind their efforts may turn yellow earth into gold. There are in all factories three men in the problem whom we must unite to reach its solution. These are: the technical man who designs our machine; the financier who backs it; the salesman who sells it. If we could unite these men in our various factories, working as a unit for the whole trade, we could almost carry out the Chinese proverb and turn the yellow earth of foreign markets into gold for American dividends.

These are the three main elements in the export of automo-

biles: the building of a car that will suit the foreign buyer; the credit which will enable him to finance his purchase, and the salesmanship that will make him willing to purchase.

Considering, in the first instance, foreign markets in general, we have said before that the general form of our problem is: "Is there a demand for my goods in such a market?" Now, the easiest form of a demand to meet is that of a commodity already in use, and the easiest way to supply it is to sell the commodity for less than the present consumers are paying for the identical thing. If an automobile manufacturer in America can learn of a field where buyers pay for an automobile such as he manufactures more than the price at which he can deliver it his problem is free of difficulties. All he has to do is to produce his car and arrange for its transport and sale. If I can find a market where they use four-cylinder gasoline cars, painted blue, weighing 2800 lb. and selling for more than the Hupmobile would cost delivered there, all I have to do is to tell my factory to make them, tell my traffic manager to ship them, and engage an agent on the other side to market them.

Unfortunately, we do not find any market so ready made. In general, for manufactured articles in the foreign market, adaptation must be made to meet the exact wishes of the foreign buyer in order to secure a foothold. The manufacturer sometimes makes an article adapted to American consumers which he thinks should find a ready sale abroad, though not identical with what people are using there. He is almost certain to find that in style his article is not what the foreign buyer wants; that it is perhaps better than the foreign article; that it is so made as to necessarily cost more than the foreign buyer is accustomed to pay, etc., etc. To these conditions he must adapt his campaign.

#### Automobile Problem Different

Our automobile problem is slightly different from that which confronts the general exporter. We find that American automobiles are generally cheaper than those sold abroad and that the foreign prospect is inclined to doubt whether a Yankee machine at the price at which it is sold can compare in serviceability with the higher-priced machine which he is accustomed to buying.

Here arises one of the great export problems: Shall we try to convince the foreigners that we can make, in American factories, a machine of our model as good as is made in the factories of Birmingham, Turin or Paris, and sell it to them cheaper than their adjacent factories can produce the same model? Or shall we devote our efforts to attempting to produce an automobile for export closely following European models, a departure from our own ideas, a special export job? To this I have but one answer—No. Let us rather develop an American model combining the best that we can find everywhere. Let us try to win by our own ingenuity, by our price, by our quality—not by imitation.

In most markets, particularly in Europe, we do not have to teach people to use and to appreciate automobiles. All we have to teach them is that American machines, at cheaper prices, give just as great service as expensive foreign makes. This is the task for the advertiser and for the salesman, and this, as I have said, is the greatest field for American foreign trade extension. In these markets, however, we are met with difficulties. We have to fear not only the dangers of a domestic combination against us, and appeals to the buying public to patronize home industries as an act of patriotism, but we have also to fear the possible erection of hostile tariffs and possible administrative difficulties created by the foreign governments, who will wish to protect their own manufacturers.

#### Patriotism in Purchases

All export managers are familiar with the advertisements of English tires now running in British trade papers, which

show us how the "patriotism in purchases" cry can be used, and it must be admitted that this is a strong appeal. It can be met only to a certain extent by difference in prices as long as protective tariffs do not intervene, and by an attempt, as far as possible, to domesticate our business, so to speak, to make it seem less foreign. To this end, a careful campaign should be conducted by all American manufacturers, accompanied by the most discreet salesmanship and advertising. We must attempt, as far as possible, to give a local character to our business. We must convince the people that foreigners associated with us abroad benefit by our success; that, while we manufacture our goods largely in America, the profits on the trade are widespread; that we are not actuated by purely selfish motives, and that a great industry is of value to a country, even if its seat is in another land.

This matter must, of course, be handled in each market in a different way, but as a general principle we should select as our representatives abroad men familiar with the markets, men whose temperaments will tend to encourage good-will rather than hostility, and we should avoid the aggressive tone of American advertising, which may not appeal to the foreign consumer in many markets. If a tariff barrier is created against us our only redress will be to invoke the action of our own Government.

As to this I make no suggestion; but it is evident that as export trade depends more on exchange of commodities than upon remittance of money, we can influence foreigners to let us into their markets better if they see that this right obtains a reciprocal advantage in our own, and also if they realize that prohibitive tariffs may work both ways.

The language in which foreign trade is to be conducted is an important consideration. It is evident that we cannot use English everywhere. This is going to be particularly true after the war. The language in which our advertisements are run should be carefully chosen to win the highest approval of the journals where printed. The language of our circulars should be adapted to meet local prejudices, and it need not be insisted upon that many at least of our salesmen should have a command of the languages of the countries in which they do business. In fact, I think it a wise measure to use local salesmen, as far as possible, in subordinate positions at least.

#### Must Create Markets

The point I wish to emphasize in the class of markets of which I have so far spoken is that we do not have to educate the people to the use of our article. There is another kind of market to which we Americans, under the spell of the ready-made markets of the world, are not accustomed to pay sufficient attention, viz.: those markets in which a demand not now existing may be created and then supplied. This applies at present on a large scale to only such trade markets as Russia and China and parts of South America. There, in wide areas, we must not only introduce our automobiles, but we must accustom the people to their use in order to sell them. This is particularly true of China. Think what it would be if we could get the Chinese Empire, with its millions of square miles of territory and its hundreds of millions of people, to widen their communications, to build motor roads and to take from their hiding places the hoards of silver and buy automobiles therewith. We would have a market there not less than that of the United States, and I believe the day is coming when we will have such a market. At present there are no roads in China except a very few scores of miles in the cities of Shanghai, Tientsin, Peking and Hankow. The age of highways is coming in Asia, as it has come with us, and we American automobile manufacturers should be far-sighted enough to put our shoulders to the wheel and to push on the highway movement in China with something like the zeal with which we are pushing the Lincoln and the Dixie highways in the United States.



This is not an idle dream. If we turn to another world-wide American industry we find that the dreams in its line have been made true by intelligence and zeal. The American Tobacco Co. some years ago found millions of smokers of tobacco in China, but no smokers of the cigarette. They made up their minds to revolutionize the habits of these millions. They started great cigarette factories in Shanghai, in Manchuria and in other parts of the Empire, and in less than two decades they have converted the Chinese from the pipe to the cigarette, until the American Tobacco Co.'s marks are familiar in every city, village and hamlet of the Empire and its business has become one of the most gigantic enterprises of the world. Our dream of a China converted to the use of automobiles is perhaps a nobler goal.

#### Develop Far East Market

This is one point which I wish particularly to emphasize in this short address—the advisability of attention to the undeveloped markets of the Far East. We talk much about war conditions; about the extent to which our prosperity depends on the war's continuance; about the possible commercial collapse which is to follow the re-establishment of peace; and about the steps of preparedness that we should take for this eventuality. In this preparedness let us automobile manufacturers not forget the great neutral market of China, where a little foresight can lay the foundations of a great future, where we do not come into conflict with tariffs addressed

more against ourselves than against others; a market which a consistent policy of good-will has made friendly to Americans. I tell you that the good-will of the Chinese market toward American manufacturers to-day is a gigantic asset that it remains for our manufacturers to convert into cash. If we do not so convert it, it will disappear gradually under the more careful attention of the Englishman, the Japanese, the German and the Russian. Now is our chance. A little money judiciously spent in China to-day in the fostering of the automobile trade will go farther toward bringing results than 100 times that money spent in any of the allied lands.

There is often doubt expressed as to whether trade follows the flag. Let me enunciate this principle: "Trade and the flag both follow the dollar." In those markets in which you invest you will sell goods.

I have quoted above the Chinese proverb that three men of one mind can turn yellow earth into gold. If we urge on our engineer to perfect the good work which he has already begun and make the American automobile a typical American product as good as any that is made abroad, and at the same time cheaper; if we can induce our financial backer not only to extend the credits which we need in foreign markets, but to finance our efforts there, I think we can rely on the American salesman to bring our enterprise to success. "The American automobile with the American dollar and the American salesman behind it" is the slogan which will take our automobiles into all corners of the earth.

## Must Realize Value of Our Own Products

By E. W. Davenport

*Export Manager, Maxwell Motor Co.*

**P**ROMINENT men and delegations returning from tours of investigation, as well as individuals of long experience outside of the United States, all tells us that the only way to develop our export automobile business is to give the foreigners what they want in the way they want it.

The European automobile man gives all sorts of options in specifications, long-term credit, etc.; therefore we must do likewise. Probably each of us has repeatedly fought with his production department for certain special features that some of his foreign dealers have convinced him were absolutely essential.

All of this is beginning to indicate that we are allowing our foreign friends to sell their point of view to us without our fully appreciating the value of our own proposition. Manufacturing, selling and financial conditions in the different European countries have been very different from those existing here in the U. S. A., and it is only natural that export customs and methods to suit home conditions should be developed by those countries particularly interested in foreign trade. Our importing friends, used to these methods, familiar with no others, and constitutionally disliking to make changes, convince us that it is to our advantage to do as they say—in other words, they have sold us their proposition.

Our whole automobile industry is based on standardization, by which are produced large quantities of cars, all practically alike and each one carrying a comparatively small overhead expense and profit. This standardization has enabled us to give automobile value far exceeding anything any European manufacturer ever gave; value that the European is beginning to appreciate and that he is worrying about.

Do we as export men fully realize the value of the propositions we have to sell? Have we analyzed them and found out for ourselves just how far we can encroach on our practice of standardization without defeating our own ends? How far can we allow our overseas dealers to sell to us the methods of the European manufacturers to be used in connection with our own manufacturing and selling methods?

Aside from furnishing right-hand drive, I believe that the

nearer we can keep to our standard car the better it will be for all concerned. Conditions in some of our factories may allow of our standardizing some features on our export models, and some makers selling higher-priced cars may be able to allow limited options without interfering with production.

#### Educate Natives to U. S. A. Methods

In general, however, we are going absolutely in the wrong direction when we turn away from the ideas and methods in which we are the strongest. I do not mean that we should attempt to stuff our ways and products down the throats of our foreign friends, but we should show them that by following our methods and using our regular product they can satisfy more customers and make more money than by handling a built-to-order car.

I want to mention the experience of a certain overseas dealer handling very successfully two American cars. On the higher-priced car a variety of options can be obtained from the factory; practically none can be had on the lower-priced one. The dealer, on the other hand, gives to his customers on both cars any colors, almost any make of tires, a variety of equipment; in fact, caters to the personal taste of those who want a made-to-order car. However, all of his cars, both high and low price, excepting only the closed bodies, are now ordered from the factories on monthly schedules and all to standard specifications. What changes are called for he attends to after the cars arrive.

Formerly he booked orders and specifications for the more expensive car, sent them to the factory and made his customers wait sometimes 6 or 7 months for their cars. He sold the small car at first just as it came from the factory, and found that his ability to make prompt deliveries, or sales to arrive on a definite steamer, was taking business away from the large car, on which there was considerable profit. He was enough of a thinker to work out for himself the idea that if he made arrangements to do the special work he had been asking the factory to do it would not cost him much more than he had been paying, and the advantages accruing, he thought, would offset any extra expense.

In practice it worked out much better than he expected. His dealings with the factory were greatly simplified. He could often take orders away from competitors because of the delivery of a car from stock, or to arrive, in the definite 2 or 3 weeks required for him to get it in shape, as against the indefinite 5 or 6 months necessary for his competitor to have the car built and shipped from the factory.

Having arrangements for special work on the large cars, he found he could also give special features on the highly standardized small cars, letting the owner purchase his made-to-order combination at little more than the price of a standardized car.

In the case of this particular dealer it has taken some time and serious thought to work out for himself the plans and details that should have been handed to him ready for application; plans by which his customers can have the price and interchangeability benefits of our methods of manufacture, and at the same time some European made-to-order features.

This combination, properly developed as to detail for different conditions and localities, is, I maintain, absolutely unbeatable. It is up to us to work this out, each on his own proposition, and present it in such a convincing way that the dealer will realize how much it is to his disadvantage to throw the combination out of balance. We must not let him feel that we are arbitrarily turning him down when we cannot grant a request of his. We must make him understand

that he is setting our manufacturing department back one step and himself two when he gets us to do something that he is better fitted to do himself. A dealer with enough ability as a salesman can perhaps make us feel as though his problems were the only ones and that we should give him what he asks for. It is in these cases that we must exert ourselves, not only to keep but to impart to the dealer the proper perspective.

The point of view of our traveling men must also be given continual attention, both for their benefit and ours. It takes a very strong-minded, level-headed man to keep home conditions uppermost in mind during a long trip. He is bombarded with every sort of argument by every sort of dealer in an effort to get him to grant concessions and to do business according to methods which may not fit in with ours. The man himself is usually chosen to go into a territory on account of his familiarity with it and the people, and he may have a natural leaning their way. It is, therefore, only natural for a man, after having been away for months, to drift into the attitude of representing the dealers to the factory, instead of the factory to the dealers. We must keep in as close touch as possible with him so as to postpone this frame of mind and get him back as soon as it does appear. With it no man can properly sell his proposition, nor can he aid us to keep the combination of methods which go to make our proposition accurately balanced.

## Close Study and Co-Operation Export Necessities

By R. J. Archer

*Export Department, Willys-Overland, Inc.*

**T**HERE are two ways in which an American manufacturing company can obtain export business. The exporting house offers the first and easiest way, as the manufacturers will be without much concern for details of handling. The export house, with its clientele abroad, will secure orders and after receipt of goods at American seaboard will attend to the somewhat complex business of forwarding.

The subject of this paper, however, requires that the second way be given detailed comment.

Foreign sales in particular require direct and close supervision, and the average export house, while usually well equipped to handle shipping and financing, does not always come up to the hopes of the manufacturer so far as sales are concerned. This applies more especially to automobiles, which, as a highly specialized article, require special sales methods by trained men to obtain maximum results.

The peculiar requirements of export trade demand that automobile manufacturers desiring direct connections have a separate and distinct department which will be equipped to handle all requirements in a way that will insure smooth running. It will be useless for them to believe that their domestic force can have sufficient knowledge to handle foreign business.

### Export Department Not Separate Unit

This export department, while specializing, must nevertheless be a component of the whole organization. It is too vitally interested in and dependent upon domestic departments to be entirely segregated. House policies, together with American methods of selling and advertising automobiles, are very important factors and must be kept constantly in touch with, even though they may have to be moderated before application abroad. The export department may be considered the medium by which the producer and the customer are kept in comparatively close contact.

The situation of this department, dependent as it is upon other links of the organization chain, can possibly be located at company headquarters to the best advantage. If the main office of the manufacturing company is outside of New York

a small subsidiary office should be had near Wall Street, by which ocean freight, marine insurance and shipping documents can be properly taken care of.

### Export Manager's Qualifications

The export manager should be a man thoroughly conversant with foreign merchandising methods, who has been broadened by contact with European export business tactics, for the British and Continental people are past masters in the game. He should have the comparative factors of export business at his finger tips, so that his perspective of all matters may be correct. He should be of a caliber to realize that his export work in automobiles must move hand in hand with domestic production and policies. Give-and-take methods are vital in these days, when the companies are making the bulk of their profit here in America.

High officials of the company should take an occasional trip abroad to more thoroughly appreciate what the export manager is contending with. There must be confidence and harmony between the domestic and export sections.

The export manager should attend all company meetings which might have bearing on his work, also any held by associations directly interested in the expansion of foreign trade. Co-operation of manufacturers, with subsequent intelligent and prompt assistance on the part of the United States Government, must be had if America is to retain her grip as a large exporting nation.

An export office, equipped as it should be to handle the great variety of detail necessary to its successful efficiency, is, in size, naturally subject to the volume of business done.

Every responsible man in the department should not be pressed with detail to the point where he cannot have time to think. A few more junior clerks cost little and are available to step into higher positions in case of necessity. Export problems, with the present bad shipping conditions, require clear heads, and a man all bound up in routine is poor material at any time.

The gathering of an experienced staff in these days of demand for export men offers no little difficulty. Clerks should be of high intelligence and receive higher wages.

Co-operation among members of the staff must be absolute. Friction in a department costs money, as it does in machinery, and offenders in this respect should not be tolerated.

The manager should arrange meetings at least once a fortnight, when topics of a common interest can be discussed.

Every member of the department should consider taking a course in foreign trade as issued by the Business Training Corporation of New York. The cost of \$30 would be well spent.

The detail of the department can be divided into sections, each section having a head reporting to the manager or his assistant.

Automobile exports have to do with the following:

- |   |   |
|---|---|
| <ol style="list-style-type: none"> <li>1. Contract.<br/>Allotment of territory.<br/>Encroachments.<br/>Contracts.<br/>Enquiries.</li> <li>2. Car Order.<br/>Production.<br/>Orders.<br/>Space engagements.<br/>Shipping.<br/>Prices.<br/>Records.</li> <li>3. Parts.<br/>Orders.<br/>Shipping.<br/>Prices.<br/>Records.</li> <li>4. Service.<br/>Claims.<br/>Complaints.<br/>Mechanics abroad.</li> </ol> | <ol style="list-style-type: none"> <li>5. Advertising.<br/>Appropriations.<br/>Catalogues.<br/>Newspaper or other copy.<br/>Records.<br/>Circular Letters.</li> <li>6. Finance.<br/>Insurance.<br/>Credits.<br/>Billing.<br/>Documents.</li> <li>7. Statistical.<br/>Factory Representative reports.<br/>Reports on commercial conditions.<br/>Maps.<br/>Mail outward.</li> <li>8. Cable.<br/>Making of private codes.<br/>Cables and telegrams.</li> </ol> |
|---|---|

In looking over these divisions and their main work a great similarity to domestic departments will be noticed. The work

of both have certain features which are in common, and location of the export department in the home office to obtain domestic precedent is quite often required.

The translation of foreign correspondence, inward and outward, as well as all advertising matter, can be more economically taken care of if a portion of the regular staff is composed of men having thorough familiarity with certain foreign languages. The extra time of these men can be taken up in ordinary clerical work.

It will probably be found that a check on all catalogue work will be required and can be had without extra cost by the printing company which specializes in this class of work.

The manager should keep personally in touch with factory representative reports and correspond freely with each man. Nothing is quite so disheartening to a salesman in foreign territory as to be neglected in this respect.

While in the above a brief outline has been given, many details of department organization must necessarily be governed by circumstances and would be arranged by the department manager.

It is believed that co-operation among the export managers of the companies having membership in this association can occur to the general good of all concerned, and the export department of the Willys-Overland, Inc., stands prepared to do anything consistent that may further this aim.

All automobile companies engaged in shipping abroad will meet with the strongest kind of competition from Europe after the end of the war, and preparedness in America among us now will later on bear valuable fruit for the trade of America in general and of automobile companies in particular.

## World's Markets Ours If Properly Developed

By Dr. E. E. Pratt

*Chief of the United States Bureau of Foreign and Domestic Commerce*

**T**HERE are some very specific and some very good reasons why automobile manufacturers should be interested in foreign trade. The first, and perhaps the most important, reason is that the foreign market in itself is a very large market. I estimate that outside of the principal producing countries—that is, France, Germany, Italy and Great Britain—there are approximately \$60,000,000 worth of automobiles imported every year. In the last normal year before the outbreak of the war exports were:

France exported over \$45,000,000 worth of automobiles; Germany exported about \$20,000,000 worth of automobiles.

Great Britain exported about \$15,000,000 worth; Italy exported about \$5,000,000 worth of automobiles.

In the same year, 1913, we exported \$27,000,000 worth.

Export trade will tend to stabilize conditions in the United States. In many lines of industry, the prosperity of the business is dependent upon factors entirely outside its control. A short crop or a bumper crop may entirely determine the output of an industry. This is, to a certain extent, true of the automobile industry. If, however, the manufacturer has a business which covers the entire world, a poor crop or bad business conditions in one country will be offset by good conditions and prosperous times in another country.

A well developed export trade will, to some extent, do away with seasons in the manufacturing end of business.

There are certain main factors to be taken into consideration in studying a possible foreign market for automobiles. The first matter to be considered is the extent and character of the purchasing public. The most important facts that can be obtained with reference to any foreign market are those that can be obtained and that can only be obtained by actually visiting that country. Every manufacturer who expects to export automobiles should in person or through a responsible representative visit those markets in which he expects to specialize. Other factors which should be considered in determining the purchasing power of a market are the dis-

tribution of population as between city and country; the character of the population in countries where there is a dual population; the distribution of wealth—whether it is highly concentrated among a few wealthy individuals, or is generally distributed throughout the community. Interesting facts with reference to purchasing power and incomes can be obtained in those countries which have adopted the income tax. The imports and exports of cars also form an index, especially where the average value of the cars imported can be obtained.

The second point of importance in studying a foreign market is, whether or not there are useable roads in that country. The third important point is whether or not fuel and oil can be easily and universally obtained.

What are the possible foreign markets for automobiles? Perhaps at the present moment the most helpful classification which could be made of markets without going into too great detail would be to divide them into three groups:

1—Belligerent countries, 2—Colonies, 3—Neutral countries.

1—It is a fair assumption that whatever conditions affecting the sale of automobiles may be, for some time after the termination of the war there will be a considerable demand for American cars during the reconstruction period, even in the automobile manufacturing countries like Germany, France, the United Kingdom, Italy, and Belgium. The character of the demand may, however, differ from what it was before the war. Attention will probably be concentrated largely on the commercial and industrial vehicles rather than on those used for pleasure.

2—Among the best markets for American automobiles prior to the war were the British Colonies. In the fiscal year 1914, about 40 per cent of our exports of passenger cars went to Canada, Australia, New Zealand and the Union of South Africa. Considering the fact that in all those colonies, with the exception of New Zealand, preferential reductions

(Continued on page 224)

# Packard Aviation Engine 4 by 6

Follows Lines of Small Design—200 Hp. at 2180  
R. P. M.—Electric Starting—Battery or Magneto Ignition

**T**HE Packard Motor Car Co. has been concentrating a great deal of effort in the development of a twelve-cylinder engine for aeroplane and airship purposes. The facilities offered in the Packard experimental department, with every instrument necessary for development work, have been employed for nearly 2 years in the development of this new aircraft motor.

Packard, however, is not yet able to announce a price nor dates of deliveries, and cannot do so until final decisions are made on several details of construction now undergoing tests. These experiments will determine the final details, and thus the price. Laboratory work now going on will settle these points within a few weeks, when more definite statements will be available. This firm is only interested in aircraft engines, and does not plan the building of planes, but rather intends to limit its efforts to the production of twin-six engines.

## Twin Six with Overhead Valves

The Packard aircraft engine is of twin-six design, V-type, with overhead valves and with the cylinders set at an included angle of 40 deg. to eliminate head resistance. The engine is rated at 200 hp. at 2180 r.p.m. The bore of the engine is 4 in. and the stroke 6 in., giving a total piston displacement of 904.8 cu. in. The engine is complete with Bijur starting motor and generator, and is fitted with two-point ignition.

The cylinders are built up of alloy steel, in blocks of three. The cylinder barrels are separately bored from solid forgings, machined outside and inside, and with attached water-jackets extending down to a point lower than is customary in automobile practice. The entire block of three cylinders with jackets weighs approximately 40 lb.

The three-ring pistons are of aluminum alloy, with excep-

tionally large wearing surface, and the connecting-rods are of I-beam section, machined all over. Forked-type rods are used on account of the saving in length and total weight. With an L-head motor, the length of the block is determined by the valve sizes, which allow space for side-by-side rods. In overhead-valve construction for aircraft work where quietness is not a primal aim of design, the connecting-rods are the limiting length factor. For this reason forked-type rods are used with the overhead-valve aircraft design.

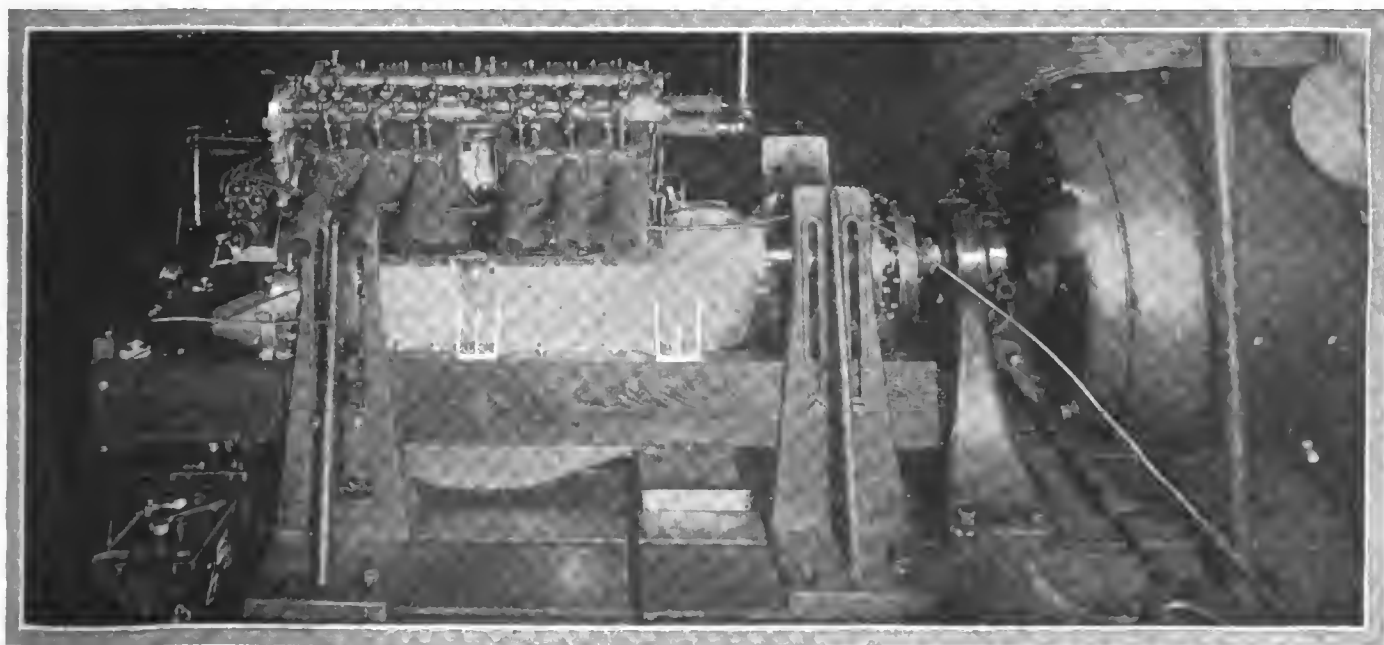
The crankshaft is made from high carbon steel, drop-forged, heat-treated, and machined all over. Three main bearings are used and all bearings are 2¾ in. diameter. The front main bearing is 4½ in. long; the center bearing, 3½; the rear bearing, 2¾; while the crankpin bearing lengths are all 2¾ in. The crankshaft is drilled out for lightness, and weighs complete, approximately 100 lb. There is individual lubrication through each separate crank throw, to each individual crankpin bearing, force-feed lubrication being used, with a pressure of from 50 to 60 lb.

No flywheel is used other than the light steel gear arranged at the rear end for the electric starting motor mechanism. This starter works in the usual manner, by the pressing of a foot-button.

## 2180 R.P.M. Operating Speed

While the engine is designed to operate at 2180 r.p.m., the propeller is geared down by a front-end spur gear mechanism to give a propeller rotation of from 1000 to 1400 per minute. This means not only that weight is saved per horsepower by keeping the revolution up to the most efficient speed for power and economy, but that there is also a large saving in the efficiency of the propeller at the slower speed allowed.

The overhead valves are set at an angle and driven by overhead-camshafts, located between the rows of valves over



Packard twelve-cylinder aircraft engine undergoing dynamometer tests at the factory

each cylinder block. The camshafts are driven by a train of spur gears at the rear end of the engine, these all running on annular ball bearings. The camshafts operate in tubular oil-tight chambers, located over the cylinders. These chambers contain the inner ends of the valve rocker arms, while the outer ends, offset from the inner through an oil-tight bearing, project outside of the case to operate the valves. This construction not only allows for perfect lubrication of the camshaft and followers, but leaves the valves and valve-springs outside of the inclosed portion so that the springs may be properly cooled and thus not lose their temper. By removing a few bolts, the entire camshaft and rocker arm assembly can be removed from the top of the cylinder head, and it is a comparatively simple matter to remove the whole cylinder block.

With modern gasoline, the design of intake and exhaust manifolds is of a great deal more importance than ever before, and is in a large percentage of cases the cause for power limitations in modern gasoline engines. The engineering department has spent possibly more engineering thought and experiment on manifolding and carburetion than on any other one item.

The practical details of construction have been given unusual attention. For instance, there are only three sizes of bolts and nuts used in the whole construction, so that one special wrench will fit all bolts, thus eliminating the weight of a complicated tool kit. Joining surfaces are lapped, no gaskets being used in the entire engine, which also allows the greatest simplicity of assembly. Arrangements are made, as have been noted, for self-starting, for the fitting of a tachometer, and an air pump for pressure feed is standard on all installations.

The overhead-valve mechanism is so arranged that by slight change the exhaust can be arranged for either outside connections with the carbureter in the V, or better, the exhaust can leave the cylinders in the V and the intake mani-



Packard aeroplane engine propeller can drive truck

folds and separate carbureters be arranged outside of each block.

One of the tests to which the engine has been put and which illustrates the pulling power may be mentioned. The engine was mounted on the deck of a 5-ton Packard truck chassis and with the aeroplane propeller drove the chassis at high speed. The rear wheels of the truck were then locked and the truck driven over ground which was covered with snow.

## World's Markets Ours If Properly Developed

(Continued from page 222)

in import duties are granted on automobiles from Great Britain and that the Canadian market is supplied to a considerable extent by the branches of American factories, the importance of the British colonial market to the American automobile becomes quite apparent. There are several reasons to account for the success of the American cars in the British colonial markets. Social and economic conditions are more like those in the United States than in Europe.

3—The neutral countries will probably offer the best market after the war. Many of the neutral countries of Europe, particularly the Scandinavian countries, have been considerably strengthened by the war. There should be there a considerable demand for pleasure vehicles and American machines would in all probability prove well adapted to meet the demand.

There is one suggestion which I would like to make to those automobile manufacturers who are going into the foreign trade seriously and that is, that they might co-operate in the establishment of foreign depots of supplies and accessories. This would solve, to a considerable extent, the problem of service which is so important in the sale of automobiles. There is no competition to be met in the sale of parts. There does not seem to be any reason why the sale of such parts and accessories could not be arranged on a co-operative basis. Co-operation would also bring about some economies in the cost of transportation. The so-called Webb Bill now before Congress, which will probably be passed in some form or other, will undoubtedly permit the manufacturers to make some such effective arrangement, and I hope that the manufacturers will press their cases before Congress.

I may say in general that I believe that the effects of the European war will show themselves in increased costs in Europe and in a higher level of prices. I base this on the assumption that the cost of labor, the cost of capital, and the cost of government as seen in taxes, will each increase following the conclusion of the war, and that an increase in each of these items of cost inevitably means a higher price level. Undoubtedly in certain lines European factory production will have remained at a high standard of efficiency. There is no doubt but that the chemical industry and the iron and steel industry will be well organized and in fair going shape at the end of the war. The same thing is likely to be true of the automobile industry which has probably been producing at high capacity in order to supply the belligerent activities of the European nations.

One of the most important possible results of the war may be enactment of high tariffs in the various European countries. If this is done in Europe it will probably have an effect upon all of the colonial governments. If such tariffs are enacted manufacturers will have to consider the possibility of establishing branch factories or assembling plants in foreign countries in order to hold those markets.

Finally and in conclusion, the market for American automobiles is almost unlimited, especially in the low-priced and medium-priced cars. The extent of the market, or rather the extent to which we take advantage of the markets, depends in fact, it seem to me, only upon the soundness of our export methods, the character of the service which we are prepared to render, and the ability of our marketing organizations.

# South Africa Needs U.S. A. Cars

## Rough Roads and Climate Conditions Widen Opportunity

By William Campbell



William Campbell, the author, in the first Maxwell car in South Africa, near Johannesburg

**EDITOR'S NOTE**—William Campbell of Johannesburg, British South Africa, is one of the large automobile distributors and accessory men in that country. Mr. Campbell has just returned to British South Africa after spending several months in U. S. A. and Canada visiting automobile factories and negotiating for new lines of U. S. A. automobile goods to sell in B. S. A. He is a Scotchman by birth and possesses that keen business judgment peculiar to his race. He is agent for the Maxwell line in Johannesburg and carries many U. S. A. accessories. Mr. Campbell has had experience in newspaper work under Lord Northcliffe.

**JOHANNESBURG, BRITISH SOUTH AFRICA**—In the many surprises of the present war none was so complete and not-to-be-expected as that of South Africa—only a few years ago the foe of Britain and still hardly recovered from the scars of that devastating campaign—spontaneously springing to arms for the help of her recent conqueror. Not only is it a magnificent tribute to the wisdom of that splendid and audacious experiment in politics which gave her self-government but equally so is it a standard by which we can estimate the mind and quality of such men as General Botha and General Smuts. When peace will give us leisure to estimate aright, when we can place in right perspective all that was hazarded in their decision to practically unaided attempt the conquest of first, German Southwest and then German East Africa, we venture to predict that the verdict will indeed award them a high niche in the temple of fame.

### How Cars Won a Campaign

But for the adoption of the automobile in modern warfare, brilliant as was the mind which conceived and so quickly brought to an issue, that first campaign—in German Southwest Africa—it could not possibly have been accomplished either so quickly or with so small a sacrifice of human lives. To enable the reader to understand it let us briefly outline the conditions. On its hundreds of miles of seacoast this German colony had its principal towns and rich agricultural country protected by an arid stretch of sand desert some 50 to 60 miles in depth presenting peculiar difficulties to infantry and cavalry, due to the absence of water and fodder. On the landward side, where the German territory abutted on Cape Colony, nature had provided an equally forbidding and barren stretch and something of the difficulties to be surmounted may be gathered from the fact that a large column of

motor vehicles had to be mobilized for water transport alone and it is estimated that every gallon of water so delivered to man or animal cost the Government \$2.50. Doubtless this gave a sense of security to the Germans and, in fact, proved their undoing. From the sea the Germans anticipated and



Map of South Africa showing the territory over large part of which Mr. Campbell extends his dealings in automobiles and accessories



Looking over the great gold mines in the vicinity of Johannesburg from a point of vantage in the city. The great bulk of the gold production of South Africa, the value of the annual exports of which amounts to \$170,000,000, is obtained within a radius of 60 miles of the city. Only a small portion of the city is visible in the illustration.



Above—T'seodien—Livingston Mission Station—The home of the author. This is situated on the border land of German Southwest Africa  
Below—Rosebank show of automobiles held in British South Africa

prepared for attack but so confident were they that the hinterland was impassable to automobile or horse that after one of the first small engagements a captured German officer declared his belief that only by laying a lumber track all the way was it possible for the automobile to have passed through. No such experiment was adopted but instead the dry bed of what was once the broad and mighty Kuruman river—a stream which now disappears into the earth 7 miles from its source—was utilized. By it, excellently provisioned with food and water, entered the British general and his mobile force and so surprised were the enemy that, forsaking their entrenchments and forts, they fled north, and, with their main forces, were ultimately surrounded.

#### U. S. A. Cars Used

In this war, as in the rebellion and the present campaign in East Africa, U. S. A. automobiles, because of their power and lightness combined with ability to negotiate sand, played an important part, Maxwells, Reos, Hupmobiles and Fords chiefly figuring.

#### Distances Are Vast

To understand South Africa, its present and the great possibilities of its future, you must visualize its vast distances, 3000 miles from the Cape to Northern Rhodesia, 1500



A view of Barrydale, Cape Colony. This may be considered as a typical South African small town

miles from sea to sea, its sparse population capable of the purchase of luxuries, there being only 1,125,000 white people in this enormous area, its mineral wealth with an annual export of gold to the amount of \$170,000,000, of diamonds to another \$70,000,000, and smaller amounts in the baser metals, its already large and important exports in wool, skins, ostrich feathers and fruits.

**Preparation for Future**

Then add to this its more than remarkable advances in agriculture with a climate capable of growing from wheat to cotton and rapidly becoming a dairy and cattle rearing country and this fostered by a government which not only recognizes the value both of the farmer and the miner in its development but is prepared to spend money with a view to the future.

**Roads Problem Is Huge**

Its government railway development has been rapid, but like the U. S. A. the problem of good roads is one whose very vastness is apt to overwhelm. In fact, outside the towns and suburban areas there are no roads, only rough tracks unmarked and practically neglected. Hence has come the opportunity of the American automobile, with its light weight, flexibility, high clearance and moderate price. That opportunity has been greatly increased by war conditions and that, too, in spite of the high price of



Above—On the 6-mile climb up the Katsberg at a spot over 3000 ft. up. This climb is encountered on the road from East London to Orange Free State, the grade averaging about 5 per cent and the road surface not particularly smooth  
 Below—In the South African sand. Stretches of 5 miles of such sand are frequently encountered in traveling through this territory





Above at left—A view of Montagu Pass in Cape Colony, British South Africa. At the right is another view in this pass, showing the climb on the road from the coast to Odtshoorn, a great center for the production of ostrich feathers. There are excellent roads in this locality in spite of the fact that there is an area of 100 square miles of sand  
 Lower—This illustration shows how U. S. A. automobiles transported the British South African troops across a desert stretch in German Southwest Africa by traveling the dried-up bed of the Kuruman River, here almost 2 miles across



Mulder's Drift hillclimb, a well-known ascent near the city of Johannesburg

gasoline—84 cents per imperial gallon—and the additional handicap that owing to high freight and duty an automobile has to be sold at considerably more than double what the U. S. A. owner pays for his car.

More also is expected by the owner from his car: It must as a daily experience negotiate with ease gradients that are not often met with in U. S. A. and that, too, with a loose, stony surface. It must ford rivers and be absolutely dependable in this work, as one cannot risk having to foot it for assistance when the nearest homestead or town may be 5 or 10 miles distant. As for sand and rough veldt, or prairie, or a steady climb of 2000 to 3000 ft., that is expected of any automobile as a matter of course. It therefore says much for automobile engineering that not only has the engineer fully met the complex problem but that the demand continues to grow in spite of

the neglect and misuse too often given the car by its owner.

Modern and progressive are terms that can with truth be applied to the South African dealer. To the pioneers of the industry it was at first often a heart-breaking experience, a great risk in capital and effort often seemingly without result. Their problems were frequently peculiar to the territory and local conditions and their limited market in the early days made the manufacturer consistently indifferent to their suggestions. What they considered and knew to be necessary for their market the maker looked on as a fad or non-essential. That they held on and triumphed is a tribute to their quality and who shall deny them their success. To-day they are the compeers of their brethren in more favored countries, pushing and capable with up-to-date garages, competent workmen, modern equipment and giving service to their patrons second to none.

The automobile market is increasingly a difficult one to break into with a new make of car and some even of estab-

lished names have prejudiced their product by frequent change in chassis or model, for it has to be remembered that dealers are over 6000 miles from their source of supply and cannot afford to take the risk of ventures that have not behind them the elements of permanency, or take the trouble and risk of carrying stock of parts to meet the demand of numerous and varied models.

After the War

After the war, what?

British makes are bound to become a serious factor but, so far, no English manufacturer is planning to produce a really cheap car. Above what you know as the \$1,000 car, the future, so far as the British Colonies are concerned, is with the English manufacturer. He will re-enter the field with some great advantage. The war has accustomed him to quantity production, his factories and equipment have been tremendously enlarged and at practically no cost to himself and he will have in his favor an intensified sentiment for "British Made." His product will have a new value, and sentiment counts more than we care to admit. It will retain the custom-made element. It will continue to possess the individual look, that indefinable something which picks it out from the article of quantity production. The British maker has learned new wrinkles from his war experience; he has accumulated capital and his markets wait for him.

Of the country itself, what shall we say?

With a climate varied enough—from temperate to sub-tropical—to permit the cultivation of all classes of produce, yet with a climate taken all over which cannot be matched by any equal territory in the world, it is ideal for automobile touring; and the trav-



Above—A typical river crossing. All through British South Africa streams of this type are encountered which must be forded in one way or another

Right — A view in French Hook Valley, Cape Colony, British South Africa. This is a great center for tobacco and grape raising. The author of the article, William Campbell, is seated in the tonneau of the car





Above—The author's Maxwell car at Montagu Pass in Cape Colony, British South Africa  
Below—One of the roads in Sanspruit. There are many roads in British South Africa that are mere trails. All through this territory bridges are very few and fording streams is a recognized part of the incidentals of automobiling

Such a tour may extend from 2000 to 3000 miles and can be done by short stages, the traveler being sure that each evening he can find comfortable and modern hotel accommodation even in the smaller towns and at a cost so moderate as to surprise.

#### Along the Coast

Along the coast line he will find a belt of comparatively low-lying land, agriculturally rich and highly cultivated much of it with a rare beauty having in it the element of surprise and frequent change. Here he will find an agriculture which ranges from corn to tobacco, from grapes to bananas, which includes not only cattle-raising and dairying but also covers the growth of wool and ostrich feathers. In rising to the high table lands of the Karoo, Free State and Transvaal he will meet steady climbs of 3000 ft. and more which will severely test the qualities of his automobile. He need not hesitate for in that the American car especially scores and he can gather confidence from the fact that many of the illustrations which accompany this article were taken by the writer on a like tour of 1826 miles. The only discomforts were a few cases of tire trouble.

#### In the Mountains

Once the tourist has surmounted these mountain passes his task is an easy one. He may indeed find difficulty in deciding which road or track to take but a little inquiry will keep him right. The scenery has entirely changed and can be best described in the words of an American visitor as "a mighty fine clearing" but the absence of trees and the monotony of the flat will be more than compensated by the exhilaration of the mountain air of the veldt at sunrise and sun-

eler, no matter what his taste may be, can have it satisfied.

Starting from Cape Town, the natural port of the sub-continent ideally placed under the shelter of the famous Table mountain, he can there begin an historical survey of the country at the scene of the landing of its early Dutch discoverers, trace the progress of civilization and with it agricultural wealth, having as its milestones the beautiful old and comfortable Dutch farmhouses. He can discover how deep a mark the Huguenots, fleeing from religious persecution, have left upon the colonies. He can follow the footsteps either of the early Dutch pioneers as they resolutely pushed inland or the advance along the east coast of the early British settlers marked by an equally distinct type of architecture. He can mark the influence and acceleration of development that followed the discovery of mineral wealth in the form of gold and diamonds. He can close his tour with a visit to South Africa's historic battlefields, concluding his holiday amid the sub-tropical scenery of our Garden Colony, reaching the shores of the Indian Ocean at Durban our great seaside resort and large import center.

and the peculiar charm of the veldt at sunrise and sun-

down.  
The visitor will do well to visit Bloemfontein and then cross to Kimberly and examine the wonderful diamond mines before proceeding to Johannesburg, the center of the largest gold-producing area in the world. The industry, the growth of a matter of 30 years, will surprise him but equally so will the town itself—modern, prosperous and growing with much of the hustle and bustle which is usually considered characteristic of American city life.

#### 480 Miles Over Rolling Country

A day's visit can be given to Pretoria, the seat of the government administration as Cape Town is the parliamentary center. The visit can be concluded by a tour of 480 miles, descending again to the coast, passing through a new and more luxuriant type of vegetation, and more undulating country and again reaching sea coast at Durban where east and west meet both in the civilization and the products of the country.

# Worm-Gear Theory and Practice

## Part I

*THIS is the first of a series of articles extracted from the paper recently delivered by F. W. Lanchester before the British Institution of Automobile Engineers. This paper is of such length that it practically amounts to a text book on the subject. While it deals particularly with the advantages of the Lanchester or Hindley type of gearing, the portions devoted to worm and wheel mounting are applicable to the parallel type of worm gear also. It will probably rank as a standard work of reference for years to come.*

**L**ANCHESTER'S original paper is divided into several parts. The introduction refers to tests which were made by the British National Physical Laboratory (the equivalent of the Bureau of Standards) of a Lanchester gear and of a parallel gear which was not named. The author explains that in accordance with the wishes of David Brown & Sons, who made the parallel gear, their name is now disclosed, and he proceeds to describe comparative tests made by him of Lanchester worms and David Brown worms in competition.

Part one of the paper considers these tests in detail, describes how sections of parallel and Hindley worms in mesh with corresponding wheels were prepared and may be summed up as the statement of a complete case in favor of the Lanchester type. Following this, the author goes on to describe various methods of mounting and this is really the most valuable part of the paper. It contains instructions for both the engineer and the factory and shows what tolerances are important and what are not.

Unfortunately, the photographs of the sections of the worms and worm wheels referred to in the paper have only reached this country in the form of reproductions and these reproductions are so faint that their detail cannot be seen. For this reason in the reprint it has been possible to use only three, and the diagrams developed from the photographs.

From the paper itself some paragraphs have been

removed for the sake of condensation. In no case do these contain any information of a very important character.

### Many Variables in Design

There are a great number of variables—an inconveniently great number of variables—in the design of worm gear upon which its efficiency depends. Without digesting the problem the factors are very numerous; there are thus the diameters of the worm and the wheel and the gear ratio, also the velocity of rotation, and the torque or the horsepower transmitted. Beyond this there is the degree of proximate contact between the pressure surfaces, and there is the question of lubrication.

The author's theoretical treatment is based definitely on the fact that the first group of variable factors, namely, the diameters of worm and wheel, the gear ratio, the revolution speed and torque transmitted, can all be represented from the point of view of efficiency in the one quantity, the pitch angle of the tooth and an assumed constant *angle or coefficient of friction*. For any set of gear between wide limits of load and speed the angle of friction is in fact almost constant, quite near enough so for the purposes of the foundation theory. On this assumption (i.e., angle of friction = constant), it is then easy to demonstrate that the efficiency will be constant for all variations of torque and speed, also that the efficiency is independent of the diameters of the gears provided that the pitch angle of the teeth is the same. The approximate truth of this is an experimentally established fact is the justification of the method, and this has been fully established by the official tests.

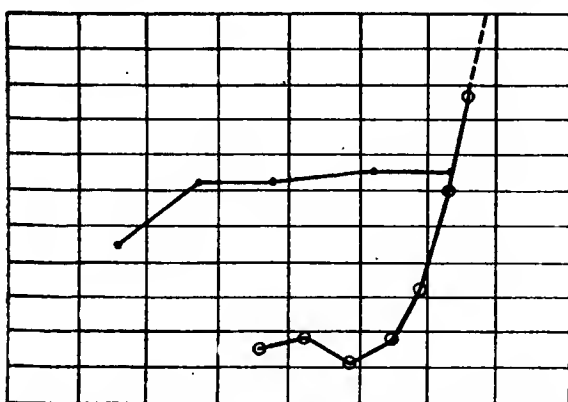


Fig. 1—Comparison between the Lanchester and Kennerson tests. The left curve called B in the text is a typical Lanchester, there being little variation in efficiency from 27 up to 62 hp. The other curve, called A in the text, is from Kennerson's work and shows a much larger variation over much the same range.

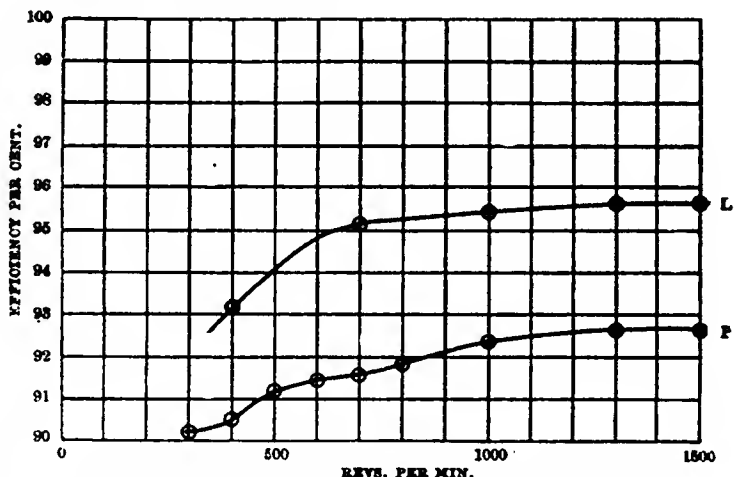
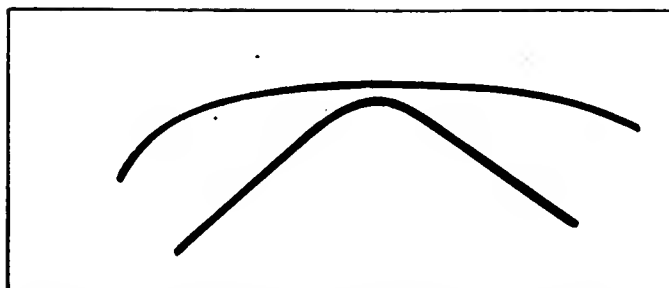


Fig. 2—Curves showing constancy of efficiency over wide range. L is a Lanchester gear and P a straight gear, both tests being made on the Lanchester machine.



Figs. 3a and 3b—The flatter curve is called 3a and is more typical of the form of a worm gear efficiency curve than is the sharper peaked curve 3b

In Fig. 1 a comparison is given between one of the tests and one of the so-called tests of a parallel worm cited by Mr. Kerr-Thomas, namely, from a paper by Professor Kennerson. Here, B, we see the test of a Daimler-Lanchester worm in which from about 27 hp. to 62 hp. the efficiency does not vary more than one-third of 1 per cent, whereas in the plottings from Professor Kennerson's paper, A, there is a curve which ranges from 35 to 65 hp. over a variation of 8 per cent. Now in the results taken with the author's dynamometer, which is certified to be true within one-fifth of 1 per cent and is probably ordinarily within 1 in 1000, a considerable range of load was found in every case, over which the efficiency was virtually constant, both in the Lanchester and parallel types, and similarly the efficiency was also virtually constant over a considerable range of speed, though here the variations were, perhaps, somewhat greater.

The author's own tests (on his dynamometer) of worm gear of the parallel type show clearly the same characteristic feature, namely, the approximate constancy of the efficiency over a considerable range of velocity. Two typical curves are given in Fig. 2.

#### Critical Tooth Load

There are two conditions under which it would appear that the efficiency *invariably* shows a falling off; firstly, when the load per tooth for any given pair of gears exceeds a certain value, the other is when the tooth rubbing velocity is less than a certain value; also there is, without question, a falling off in the opposite extremes if a sufficiently great range of speed or load be investigated. Otherwise the approximate constancy of the angle or coefficient of friction may be taken as established. It is evident that the constant condition corresponds to the minimum value of coefficient, or conversely the maximum of efficiency. In the nature of things, where A is a function of B, A is approximately constant in respect of B when A is a maximum and when A is a minimum. This is as commonly expressed in the equation for maximum or minimum value as  $dA/dB = 0$ . Thus there is nothing extraordinary in the fact as stated. Its importance from the point of view of the theory of worm gear efficiency lies in the fact that the maximum is rarely, if ever, found to be a "peak," it is rather a "table land," it is of the type shown in Fig. 3a, rather than the type shown in Fig. 3b. It is a further point of importance in connection with the theory of worm gear that the practical range of usage over which efficiency is important does not carry us into the regions where the higher coefficients are met with. Indeed, it is actually the increase of the coefficient and falling off in the efficiency under excessive load that determines sharply the maximum load limit to which any given pair of gears may be subjected, for a very moderate increase in coefficient above its normal "least value" results in, or is evidence of, the partial breakdown or rupture of the lubrication film and the disintegration of the gear.

This is the case whether it be of the Lanchester or parallel type; in fact the increase of the coefficient under heavy load-

ing is the first sign of incipient lubrication failure, and so the point of fall in the efficiency curve under heavy loading may be taken as an invariable indication, in the comparison of any two pairs of gear, of their relative higher load limits.

In engineering practice we are accustomed to meet problems in which the coefficient of friction is legitimately treated as constant; in all these problems certain actual variations exist, but the underlying fact is so nearly true that the basis theory is correctly founded on the assumption of a constant coefficient of friction, and such changes as are met with are considered as variations from this constant value rather than in relation to the zero.

So far we have dealt with the group of factors which determine the efficiency as based on the coefficient of friction; in other words, we have confined our attention to the group of variable quantities which suffice to determine the efficiency *once the angle of friction is stated*, and have seen that these are summed up in the one quantity, the *pitch angle*. It is clear that the assumption of a constant angle of friction simplifies matters to the utmost possible extent, for in place of the multitude of different variables we have only to consider the pitch angle of the tooth, that is, the angle relatively to the worm axis—all the quantities on which this angle depends are then accounted for.

The other half of the problem is to deal with the factors on which the constant or minimum coefficient of friction for any given pair of gears depends, and more broadly the factors on which the extent of the approximately constant range depends, for it is the extent of this range in the direction of high loading which determines the maximum output capacity at any given speed of a pair of gears, and so determines their commercial value as an engineering asset.

The commercial value of high power-transmission capacity from an automobile standpoint may be regarded as even greater than from an engineering standpoint, for the importance of weight saving is paramount. Thus, if two sets of gears, one of 8 in. and another of 10 in. centers, were to possess the same horsepower capacity of a given revolution speed, and even (owing to a difference of design or material) were to cost the same, one might be justified in considering them equally favorably in any ordinary engineering problem, but if the 8 in. center gears weigh proportionately less than the 10 in. center set, they will be far more valuable, and a more saleable article, from the point of view of the automobile constructor and user.

#### Two Types of Efficiency Curve

The efficiency curve in any case is of the type represented in Fig. 3a. At very light loads the efficiency may be poor owing to the fact that oil is being churned in the gear and churned in the bearings, since the power so consumed is virtually independent of the load. On the other hand (as already pointed out) the efficiency curve falls at heavy load owing to the thinning and incipient breakdown of the lubricating film.

It has been regarded as open to question to what extent the magnitude of minimum coefficient (maximum efficiency) is controllable; the author has found evidence of considerable variation according to the type of gear and lubricant. If it were not controllable, then the maximum efficiency for every individual pair of gears under the most favorable conditions would depend definitely upon the pitch angle of the tooth, and would be the same whether the gear is of the parallel or Lanchester type.

It has also been regarded as an open question whether the *breadth* of the "table land," if one may say so, of the efficiency curve can be increased. Thus it might be argued that if, by obtaining better proximate contact (by any means) the breaking down of the lubrication could be persuaded to take place at a *higher* tooth load, this same greater proximity of the tooth surfaces may result in a higher viscous churning

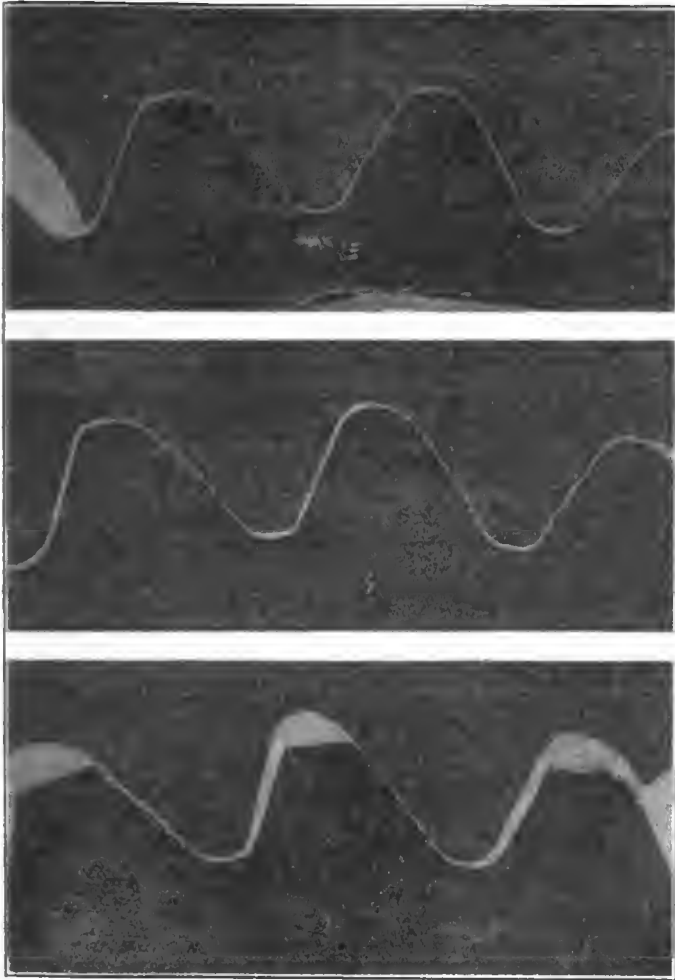


Fig. 4—Sections of Lanchester gear

resistance and so take off in the range of coefficient at one end what it puts on at the other.

Although the author is prepared to take a liberal view and say that these points are open to controversy, his opinion, as based on present-day experience, is decidedly that a better type of tooth contact corresponds to an absolute lower minimum coefficient—probably due to a *thickening* of the oil film over the load-bearing area, and that this does not of necessity add to the churning loss, and thus the improvement results in an *absolute* broadening of the top of the efficiency curve, that is to say, an increase both in the *maximum* efficiency and in the *range* over which there is no sensible falling off.

But the benefit of obtaining high tooth loads by improving the proximate contact of the teeth does not depend intrinsically on an actual increase in the range. Even if what be gained at one end be lost at the other, the result of improving the proximate contact of the teeth is to enable a given pair of gears to transmit a higher standard of loading. Conversely, for a given horsepower transmission a smaller and lighter set of gears may be employed, with a saving of money in material and machining, and a saving of weight in the gears themselves and in the mounting.

We therefore realise that the essence of power transmission worm gear for automobile purposes is to be sought in achieving the highest tooth load compatible with the maintenance of the oil film and the approximate minimum coefficient of friction; any and every improvement in the area of proximate contact of the tooth surface in engagement with one another will be reflected in a bigger output from a given pair of gears and a reduction in the size and weight of gears for a given performance. It is one of the main objects of the present paper to examine the differences and relative

merits of the Lanchester and parallel types of worm gear in this respect.

The advantage of reducing the centers and diminishing the size of a pair of gears for any given automobile is not only a matter of weight saving, important though this may be: it is equally a matter of compactness of design. It is and has been one of the difficulties in the application of worm gear to the back axle that if the worm be arranged beneath the wheel the ground clearance is jeopardised, and if it be arranged above the wheel the body clearance has to be cut fine. The result of experience appears to show that for the English market the question of ground clearance is the less important; a full

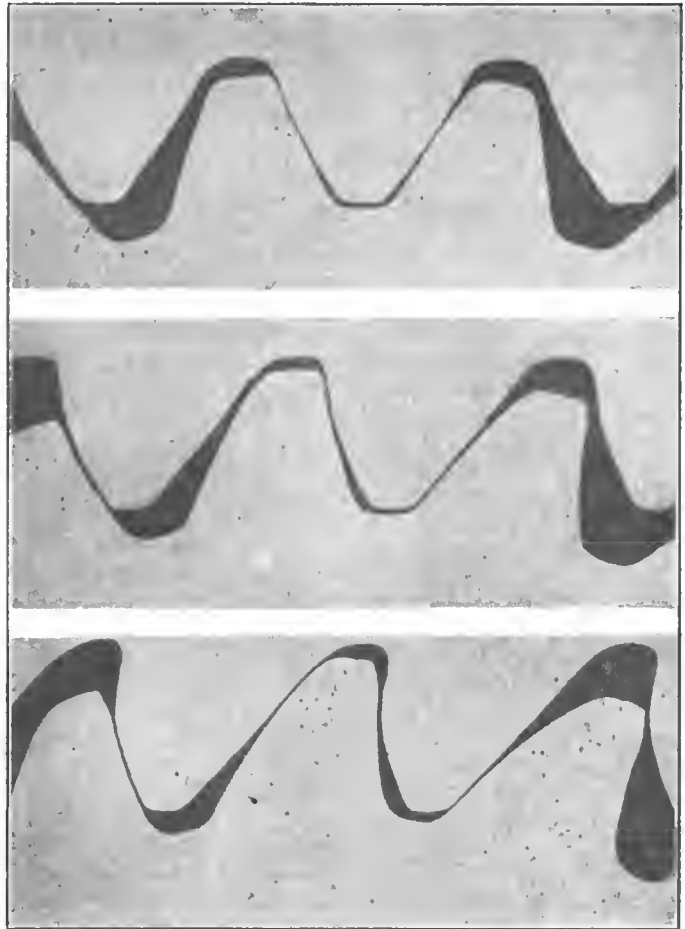


Fig. 5—Sections of straight worm gear

size touring car with 35-in. driving wheels and a worm gear of 6-in. centers can be designed to give an 8-in. clearance in the center of the rear axle, and this has proved itself ample for use in the British Isles, where consequently the underneath worm is widely used. It must be remembered that a clearance of 8-in. on the rear axle is as good as a clearance of perhaps, 12-in. or more under the body of the car, since the body clearance has to allow for longitudinal undulations of the road as well as lateral, with an additional allowance for spring deflection.

It has been reported from colonial sources that the worm underneath is objectionable as not providing sufficient clearance. The author is doubtful whether this objection is generally valid; the same objections once carried weight in commercial circles with regard to the home market. It seems incredible, with the wheel base now accepted, some 132 or 144-in., or more, that, if a clearance of 12 in. is required under the axle, anything less than 18-in. or 20-in. can be sufficient under the body of the car. Apart from the mere question of actual clearance, a contact between the road or chance boulders and the flywheel or base of the engine is

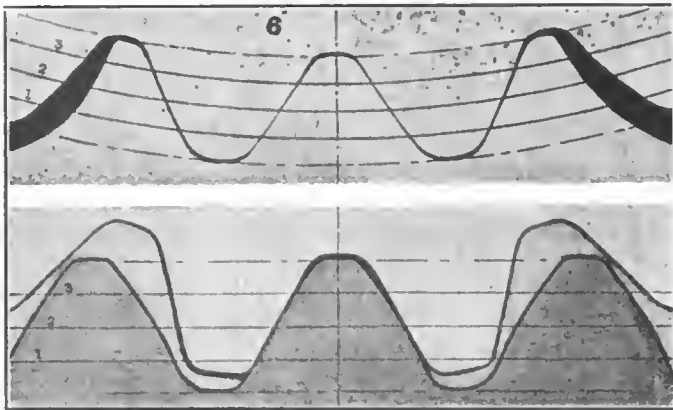


Fig. 6—Sections of Lanchester and straight gears in mesh, the Lanchester gear being the upper of the two

liable to prove far more serious than the contact of the comparatively robust housing of the worm gear. However this may be, the objection exists, and has been sufficiently strong to induce many of our constructors when adopting worm gear to place the worm above instead of below.

When the worm is placed above the axle the question of body clearance gives trouble. Now the fashion, at least for the home market, is to keep down the floor level as low as possible—a “pleasure” car with a high floor level and center of gravity is to-day unsalable, in the author’s opinion rightly so. The result of this is that where cars have the worm placed above the axle it is often found necessary to gouge a piece out of the rear body, and fit a casing which protrudes through the rear body floor in order to provide the necessary clearance.

Beyond the above, the cooling of the worm box with the worm on top is inferior to what it is when the worm is placed underneath; the actual importance of this point depends upon the general design of the car.

There is thus every inducement, apart from the already important consideration of weight, to endeavor by all possible means to obtain the maximum horsepower or torque transmission capacity from a gear of any given size.

It has been shown that in worm gears of different types the efficiency depends upon two factors, the pitch angle of the teeth and a constant—the coefficient of friction. In the work done with the author’s dynamometer, it has been made abundantly evident that the constant, the coefficient of friction, has a different value in different cases; it is liable to slight variation in almost every different pair of gears tested, but the variation only becomes marked when the type of gear as determined by the system of cutting differs. The author’s suggestion has been that the value of the coefficient is affected by the *degree of proximate contact of the teeth* and the consequent variation in the thickness of the oil film. Over the region by which the tooth load is borne—the thicker the oil film the lower will be the coefficient of friction.

It would be possible in the case of the parallel gear to determine as a matter of pure geometry the extent of the clearances and the radii of curvature of the surfaces in contact at different points on the worm and wheel teeth where in engagement, and in fact in some degree this has already been done. It is conceivably possible that the same method might be used in the case of the Lanchester gear, but it would be extremely tedious and difficult, and at the best somewhat uncertain. For the purpose of the present paper it has been thought preferable to arrive at the result in both cases by actually dissecting a set of gears soldered together and reproducing the teeth form to an enlarged scale by photographic means. From the photographs so obtained it has been found possible to prepare drawings showing the curvature at the engagement surfaces along the path of motion, that is to

say, more or less nearly normal to the plane of the photographic section.

In order to avoid unnecessary sectioning both faces of each slice were photographed as representing sections, and the thickness of the slice (one-eighth inch) was made the same as the thickness of the saw used in the cutting operation. In order that the photographs should read correctly, that is to say, so that they should be readily intelligible, the alternate number were reversed photographically, so that instead of the views being from alternately in front and behind the gear wheel as is actually the case in examining the sections themselves, the photographs given in the plates illustrating the paper represent a series of sections one behind the other, all viewed in one direction.

Figs. 4 and 5 give sample photographs of sections, Lanchester and D. B. S. respectively, to an enlarged scale.

The point of view of the photographs, however, does not give as clear an impression of the form or of the contiguity of the contact surfaces as might be wished; in order more fully to realize the type of the contact as defined by the difference in the radius of curvature of the two surfaces in their direction of relative motion, a *development* is required, in the case of the Lanchester the surface being one of double curvature. Any such development is of necessity a matter

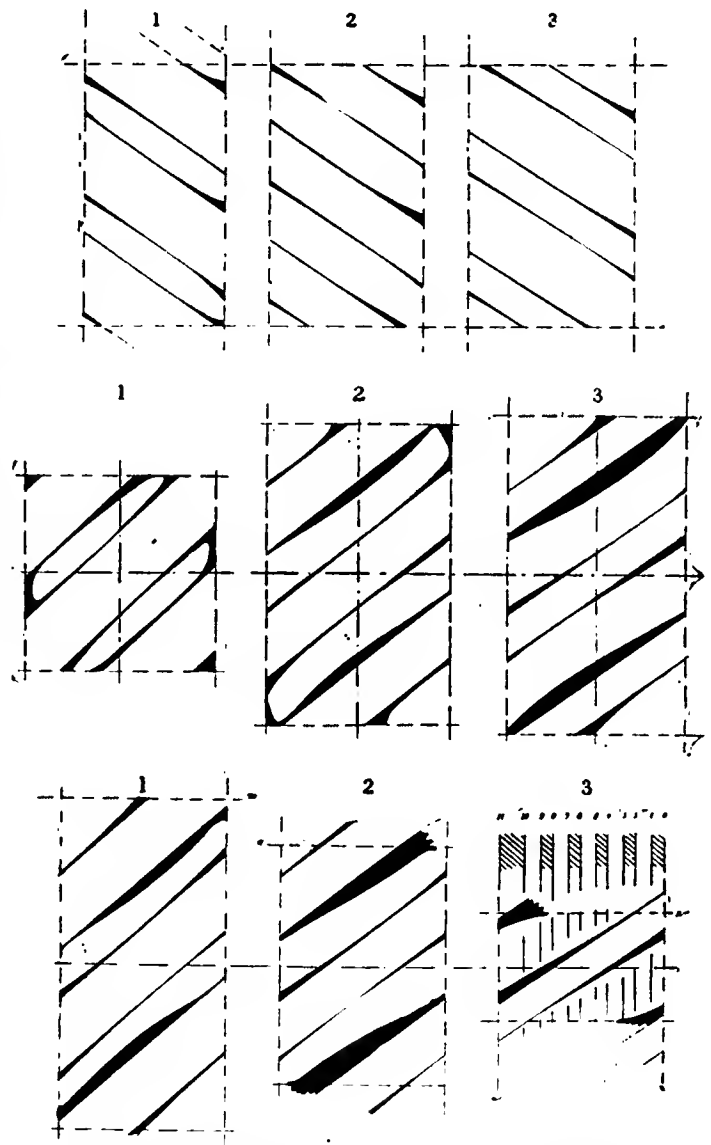


Fig. 7—Developments showing areas of contact discovered by cutting up into sections various worm gears. The top one is called a in the text, center b and lowest c

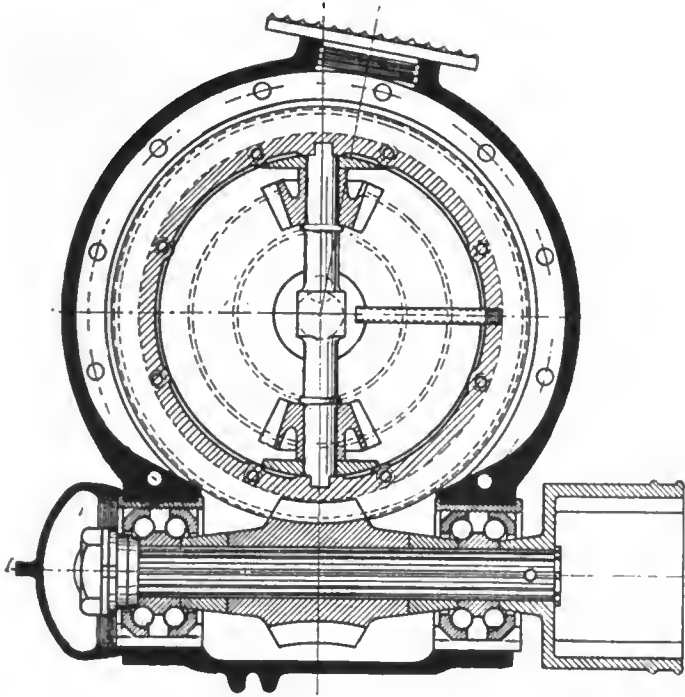


Fig. 8—Old fashioned worm gear with bicycle type bearings

of convention—a convention involving some degree of distortion.

In the present case the construction adopted has been to take a number of concentric sections, three in all, one on the center of the tooth height or pitch line, and one at one-quarter and one at three-quarters of the tooth height respectively; the reconstruction has been made in Fig. 7a, representing the Lanchester gear, and Fig. 7b, representing the parallel type. Since it is not the absolute curvature of the surfaces which is important but rather the *difference of curvature*, and in order to avoid complicated draughtsmanship, the worm tooth faces have, as a matter of construction, been represented by straight lines, and the whole of the curvature has been assigned to the worm wheel teeth. Thus the tooth sections shown in Figs. 7a and 7b represent correctly the interspace between the teeth in engagement at various points, and so define the degree of proximate contact between the teeth, but the curvature of the worm and wheel tooth faces respectively must not be taken as individually represented.

Referring to Fig. 6 in which are shown the middle sections respectively of the Lanchester and the D. B. S. gear, it will be noted that whereas the surfaces represented by their development in Figs. 7a and 7b are surfaces of double curvature in the Lanchester gear, they are ordinary

cylindrical surfaces in the case of the parallel worm; clearly, it is necessary to adapt the geometry to the variation of type. Thus, whereas in the Lanchester, as before stated, the development, Fig. 7a must be regarded as to some extent a convention, in the case of the D. B. S. worm it is a true development of a right cylinder, and the assumption of the uniform and parallel worm teeth is strictly accurate. In the sections Fig. 6 the three surfaces of section at  $\frac{1}{4}$ ,  $\frac{1}{2}$  and  $\frac{3}{4}$  of the tooth height are numbered respectively 1, 2 and 3 in both cases, and corresponding figures of reference are given in Figs. 7a and 7b.

In order that it may be quite clear that the difference—the very striking difference—between the character of the clearances in the Lanchester gear 7a and the D. B. S. 7b are in nowise due to the difference in the manner of defining the surfaces of section, Fig. 7c has been prepared on the same basis as that of Fig. 7a. It is not only clear here that no exaggeration of clearances has resulted from the method of representation, but it is also clear that the surface of section must necessarily be chosen in harmony with the geometrical basis of design—thus, in Fig. 7c, the conventional worm teeth appear in places where they actually do not exist.

Now referring to Figs. 7, a, b, and c, it may be observed that we are not much nearer being able to define how much of the worm tooth *actually takes the pressure reaction*, but reading these figures in conjunction with the photographs (not published), we are in a position to state that for a given size of gear (centers), the effective area called upon to support the load will be greater in one case than in another. With so marked a difference in the curvature of the surfaces between the two types, if there were not some corresponding difference in the test result it would certainly be extraordinary.

Of the experimental fact that the Lanchester type of gear will carry more load, centers for centers, than any parallel type hitherto tested, I think there is no doubt whatever. In the results now published there is an adequate explanation of and reason for this experimental fact.

Method of Cutting Sections

In planning the cutting up of the worm block into sections, consideration was given to the fact that it is desirable to have one of the sections in the plane of the worm axis (as in sections Fig. 6); the plan adopted is shown diagrammatically in the right-hand section (3) of Fig. 7c. The alternative presented itself of either milling away the last section and having no terminal record of the tooth, or of leaving the last section double thickness—the latter was the course adopted. Thus, taking the original face preceding the first section as 0, the total width being  $1\frac{1}{2}$ -in., the middle section falls to 6, and what would have been the eleventh section is missing, the terminal face being so numbered.

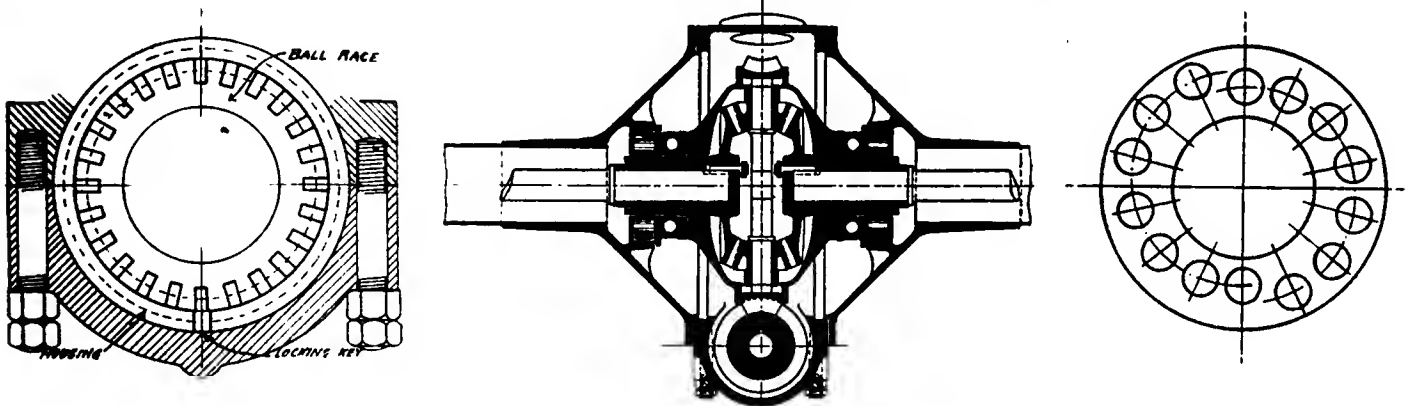


Fig. 9—Method for locking adjustment of bearings shown in Fig. 8; Fig. 10—Method of mounting worm wheel on roller bearings with ball thrusts, and Fig. 11—Staggered balls in old thrust race to prevent uneven wear



The conditions under which the rubbing surfaces of worm and wheel perform their duties are not sufficiently defined to enable an *a priori* estimate of the bearing capacity of the surfaces as based on their radius of curvature, or rather their difference of curvature. The curvature, however, must nevertheless remain some criterion and, as an approximation to the truth, it would be reasonable to assign the bearing or load capacity on the basis that a certain proximity of contact is effective in the transmission of pressure as due to the oil film. The area of the two surfaces capable of transmitting pressure may be taken as an area over which the tooth surfaces come within some definite small distance one from the other. As a working basis we might take one of the surfaces as a plane, and the area in question will then be proportional, for spherical contact, to the radius of curvature. Where the contact is ellipsoidal and we know the radius of curvature of the major and of the minor axes, the area of proximate contact may be taken as proportional to the product of the square roots of the two.

The application of this method of assessment is not so easy. For example, in the Lanchester gear in Fig. 7a, and also in the actual photographs, there are surfaces which are optically in contact, and it would take more refined methods than those so far employed to enable the curvature difference to be assessed. In the D. B. S. gear, on the other hand, the curvature difference, both in Fig. 7b and in the photograph, is very considerable, but the variations are very considerable from place to place.

#### Worm Gear Mounting

It has frequently been urged, to some extent truly, that the Hindley or Lanchester worm gear requires greater precautions in mounting than is the case with a gear of the parallel type. The point is that whereas in the Lanchester type the worm thrust has to be accurately located, in the parallel type so long as the worm axis is correct as to position, the longitudinal location of the worm is of no importance. The matter may be carried a step further; worm gear of the parallel type in turn may be said to require more careful mounting than common screw gear, in which both worm and wheel are of the ordinary screw-cut spiral form. Thus the argument that the Hindley or Lanchester gear is at a disadvantage, on account of the extra precautions required, as compared with parallel worm gear, may be quite as reasonably urged against worm gear of every kind in favor of ordinary screw gearing such as is commonly used to drive the side shaft of a gas engine. Such arguments are clearly without weight if any adequate advantage can be shown.

In practice the whole point of difference hinges on the correct location of the worm thrusts, since in every other respect any want or loss of alinement affects both types of gear equally. It may be doubted as a matter of experience whether the Hindley type of worm gear is actually at as great a disadvantage as its detractors would represent, the Lanchester gear at least has shown itself capable of working surprisingly well under the severe conditions which supervene when a worm thrust bearing fails. Admitting, however, that the durability of the gear does definitely depend upon the permanence of alinement as determined by the thrust bearing, the problem itself resolves itself into the comparatively simple question of how, under manufacturing conditions, the initial accuracy of alinement can be secured; beyond this, the durability of the alinement resolves itself into a question of fixing the proportion and type of thrust bearing best employed, and of the general soundness of the mounting as a piece of engineering.

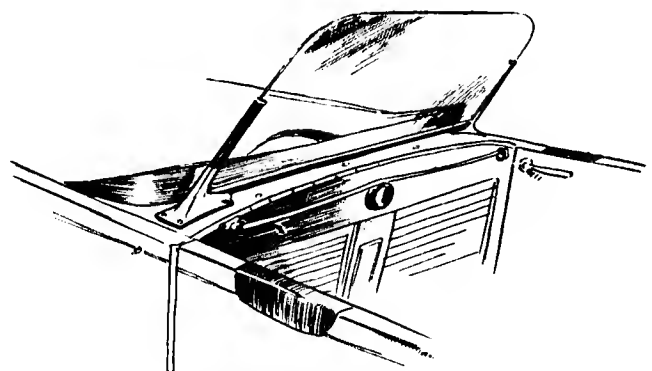
The earliest type of mounting employed in the application of worm gear to the original Lanchester car is shown in Figs. 8 and 10. Here it will be noted that the ball bearings are not of the modern type, the design dating back to a time when such bearings were not a standardized or a marketed

commodity; two double bearings of the bicycle cup and cone type are arranged at opposite ends of the worm, the whole combination being symmetrical. The cups were made adjustable by housing them within an internally screwed sleeve piece, and the adjustment was fixed by a key or cotter engaging with one of twenty-four notches cut in the periphery of each cup, Fig. 9. The pitch of the thread was twelve per inch, so that the design gave a capacity of adjustment to within approximately three and a half one-thousandths of an inch, which was found to give satisfactory results in practice. Here we stumble against one of the misconceptions which are current with regard to the Hindley type of gear; it has often been represented that the accuracy of alinement of the worm required to be true to within a thousandth of an inch of geometrical accuracy; from the success of the arrangement described, it is clear that no such degree of accuracy is essential.

It will be noted in the bearing in question that, as in the case of the old bicycle ball bearing, there is no separate function of cylinder bearing and thrust, and without doubt from a modern standpoint the type of bearing shown in Figs. 8 and 9 would be considered lacking in durability. No trouble was experienced from expansion, due to temperature, as between the two thrust bearings, and it is fair to regard the casing, as indeed the whole of the parts, as sufficiently elastic to take up any small temperature difference. It is possible that at times one thrust bearing is called upon to sustain more thrust and at other times less than its fellow, but there has been no actual evidence of this taking place.

The worm wheel bearings shown in Fig. 10 are roller bearings of the cheese roller type without cake of any kind. These are in fact the bearings on which the balance gear box is mounted, and the worm wheel itself forms the central section of the balance gear box. The thrusts were of a specially designed type, and consisted of balls in a flat cage between two perfectly flat ground and hardened thrust washers, the balls being arranged in a spiral manner, Fig. 11. The object of this arrangement, is that each ball may bear on a different part of the flattened surface, so distributing the wear; a further advantage is, that if the balls vary amongst themselves as to diameter, as is commonly the case, each ball will form its own race and will soon be taking its due proportion of the load—the markings on the thrust races frequently gave evidence of this action. The degree of inaccuracy amongst balls of nominally the same diameter is commonly less than one ten-thousandth of an inch. This form of bearing was in every way successful and satisfactory; that it has since been dropped is due to the fact that excellent thrust bearings have now been placed on the market by specialized manufacturers.

(To Be Continued)



Of the tonneau windshields appearing on a number of cars at the salon and at the Palace show, the majority were made demountable in some way. This shield on the McFarlan was fitted as solidly as any front compartment glass. Combining rigidity and light weight it was also one of the best appearing, seeming to fit in with the body and not giving a makeshift impression.

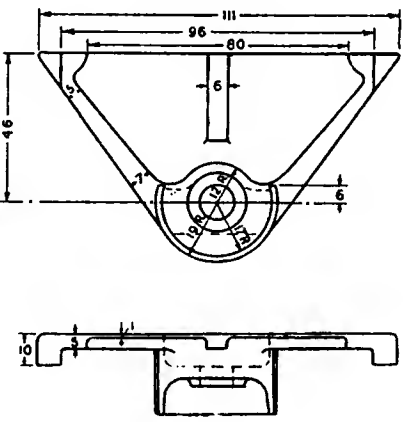
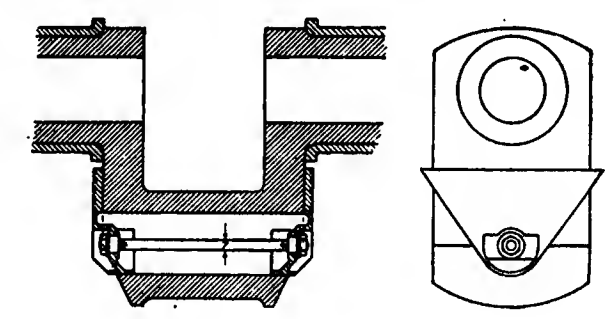
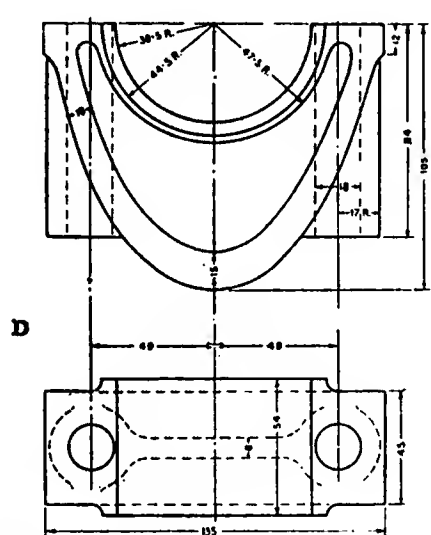
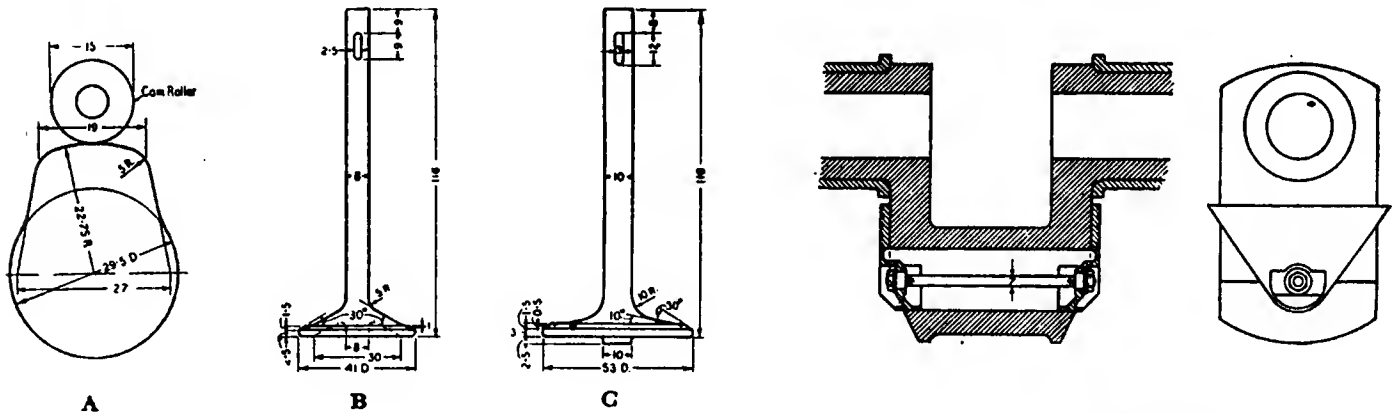
# Zeppelin Power Plant Engineering

## Part II

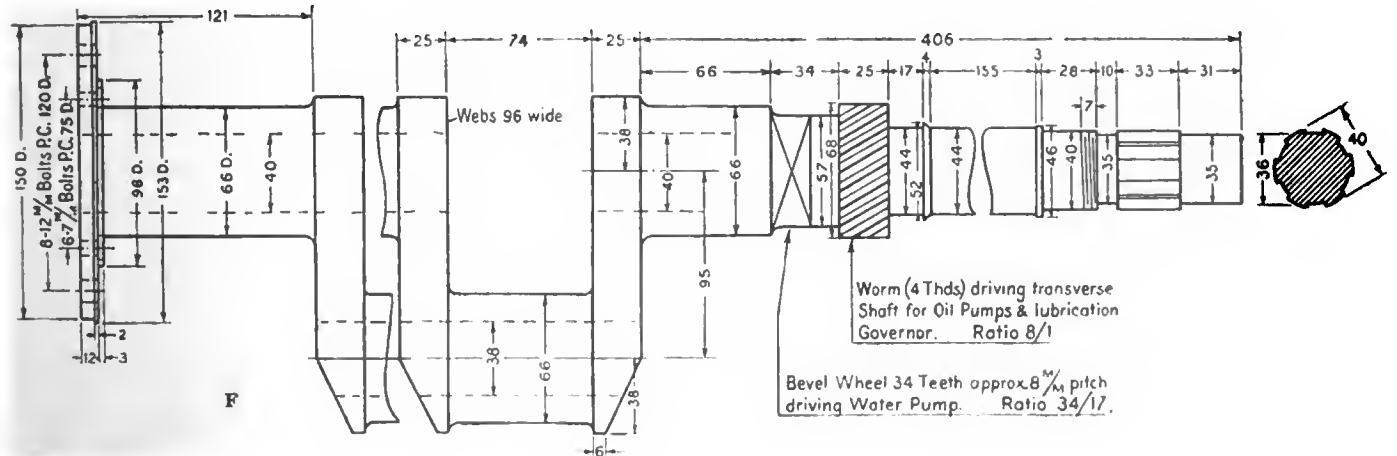
### An Exhaustive Study of the Details of German Aircraft Engine Construction as Embodied in Zeppelins Recently Brought Down in England

THE fitting in Figs. 11, 12 and 13 is in appearance a cylindrical vessel, and is bolted at its top to the rear end of the bottom half of the engine crankcase, as shown at A in Fig. 2. It is divided into two portions, ab-

solutely separate, the top one being devoted to the oil filtration, and the lower one to the fuel system. The two portions presumably are located together merely for convenience—it may possibly be with the object of warming



A—Inlet and exhaust cam—  
lift of cam 8 mm., lift of  
inlet valves 9.3 mm., lift  
of exhaust valves 7.8 mm.  
B—Exhaust valve.  
C—Inlet valve.  
D—Main bearing cap.  
E—Oil catcher (aluminum  
casting).  
F—Crankshaft.

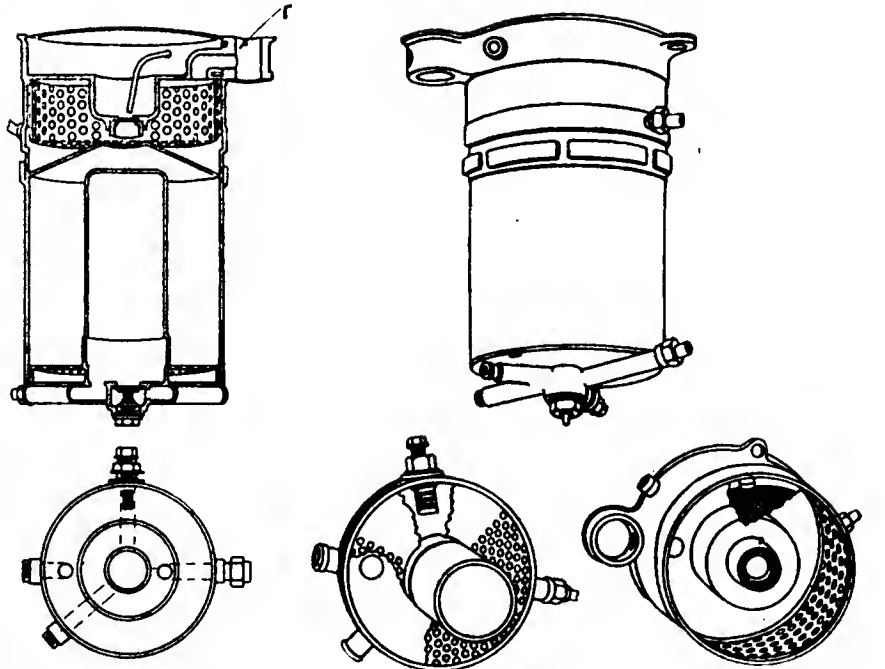


the fuel, and at the same time to assist in cooling the oil. Into the side of the top half a pipe leads from the oil pump, and the oil, passing through the gauze filter, issues from the pipe that leads to the main bearings, Fig. 3.

The bottom portion of the device forms an air vessel and valve box for the pump used in the fuel supply system, and will be seen from Fig. 1 to be connected with the horizontal piston pump shown in Fig. 10. On its suction stroke the piston will cause the suction valve to open with a reduction of pressure in the chamber K, Fig. 1. Whatever may have been drawn by the pump through K will be forced, on the compression stroke of the piston, through into the larger chamber, from which there is a pipe leading to the reservoirs above the jets of the two carbureters. The pump, therefore, effects delivery of fuel, and the two chambers in connection with the valves are intended to equalize the flow inward and outward in a manner similar to the dome or "air vessel" used on many types of pumps, and commonly seen on the fire engine. As the pump in this case is situated at a little higher level than the air vessel, it is evident that no fuel actually reaches the piston, and that it is effectually pumped without connection with the pumping medium, the difficulty—or practical impossibility—of pumping liquid gasoline being fairly well known.

**Complicated Fuel Feed**

In Fig. 9 is presented a diagram, and in Fig. 14 a perspective sketch of the mechanism that is in effect the float chamber. This device was carried beneath the base chamber, and well away from the carbureters. It consists of a cylindrical metal tank divided into two compartments, the lower being the larger. In the center of the bottom of the upper tank there is a tube depending well down into the lower one. This tube forms the only means of communication between the upper and lower chambers, and its lower portion makes a rough guide for a large float contained in the lower chamber. At its upper end there are two seatings for a double end needle valve. Normally this needle valve is held down on its lower seating by a coil spring. Provision is made that, as the lower tank is filled, the float rises, and a striker plate carried at its base, through the medium of a rod, lifts the needle valve up from its lower seat and causes the top point of it to close upon the seat. The striker rod that effects this is carried centrally on guides in the depending tube, and is divided in the middle, the halves being held apart by a coil spring presumably to give a cushioning as well as a "time" action to the mechanism, allowing the float a certain amount of travel before definite action takes place. The upper seating of the valve communicates with the upper tank, and is inclosed in a cylindrical gauze filter box. To the small chamber containing the needle valves, a pipe from the air vessel is connected, and, since suction from the pump takes effect upon the needle valve chamber, fuel will be caused to flow in from the pipe in the upper chamber of the fuel regulator. This fuel will flow through the lower portion of the chamber shown in Fig. 11, and up to the fuel reservoir in the carbureter, any surplus from the carbureter returning down the overflow pipe into the lower half, or float chamber. As soon as this float chamber fills, the float rises, and eventually lifts the double end needle valve off its lower seating until it closes instead on to the upper seating. The suction is thus transferred from the upper chamber to the lower one until the gasoline contained therein is used up and the float falls, allowing the needle valve to resume its normal



Above—Fig. 12  
Below—Fig. 13

Fig. 14

position and the supply its normal flow. There remain two more inlets to the float chamber, one of these being connected to the second carbureter, and the other to a pipe carried sufficiently high to prevent leakage, but open at the end to provide an air vent to the float chamber. The fuel regulator device is made necessary by the system adopted for jet feed in the carbureter, a system probably arranged in view of the particular importance of avoiding fire dangers on an airship. The carbureter proper thus contains a minimum of fuel, the bulk supply in the float chamber being well removed from the danger zone of the engine by location beneath the base chamber. The arrangement employed also uses up any surplus that overflows through the jet feed.

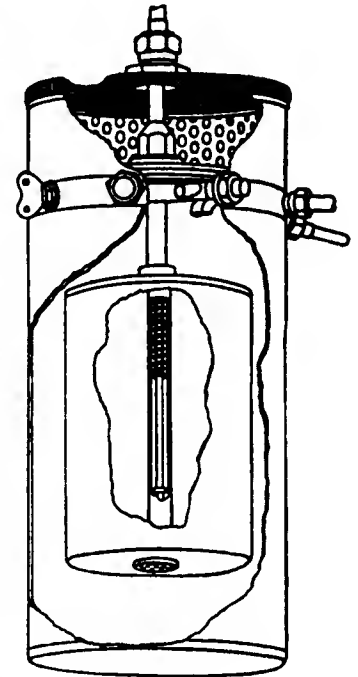
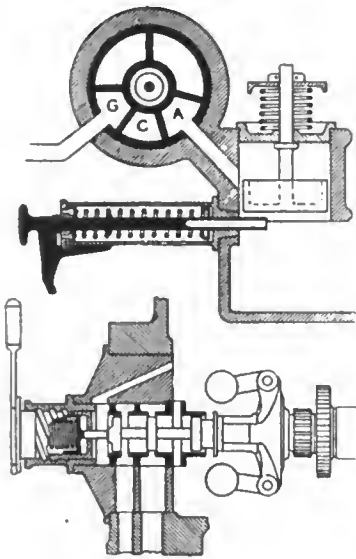
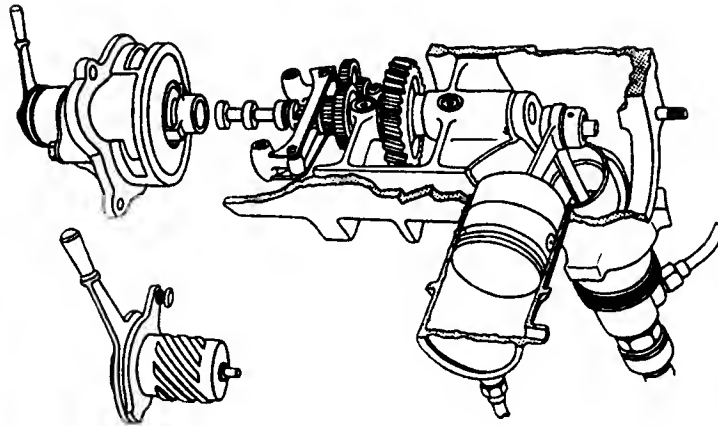


Fig. 15

In Figs. 1, 15 and 16 are shown the essentials of a system intended to prevent the engine running if the pressure of oil in the lubricating system fails. Inside the crankcase is a short cylinder open at the bottom end and containing a short piston, the rod of which passes through a guide in the cylinder cover and terminates in a collet between which and the cover there is a compressed coil spring. This spring endeavors always to draw the piston upward into the cylinder on to a stop on the piston rod, the travel on the piston being limited to about three-eighths of an inch. Above the piston a port is provided in the cylinder wall; this leads to a port A, in a circular casing, the center of which forms the cylinder barrel of a triple piston slide valve, shown in section in the lower diagram of Fig. 15. In the one position of the piston valve, the port A is in direct communication through the circular distributor body with the second port G, and G is connected by a pipe to the outlet in the top half of



Left—Fig. 15



Above—Fig. 16

the device shown in Fig. 11; that is to say, in brief, that any pressure in the oiling system is communicated to the cylinder and tries to force the piston downward. Bolted horizontally into the crankcase beneath this cylinder is a case containing a spring-loaded plunger, the normal position of which is with the rod projecting into the sump as far as it will go. This plunger case is so placed in the crankcase that the rod just clears the piston when the latter is in its highest position. At the outer end of the plunger is a striking arm that engages the end of a small laminated spring fastened to a rocker shaft connected by a series of bell crank levers and rods with the quick thread rising jet damping device shown beneath the jet hole in the diagram of the carbureter. With the plunger in its normal position—that is, projecting inward to the crankcase well under the piston in the manner shown—the dampers are lifted and the jet holes closed, or nearly so, according to the adjustment. An arrangement is provided on one side of the engine bearers whereby the plunger rod can be drawn outward by hand, so that the jets are opened.

The operation is probably as follows: Before the engine can be started up the plunger rod must be drawn by hand outward in order to open the jet dampers. When the engine is started, so soon as pressure exists in the lubrication system, the piston will be forced downward opposite the interior end of the plunger rod, so that if the grasp on the latter be released it will move inward only a short distance, because the interior end of the plunger rod will strike against the side of the piston. So long, therefore, that pressure in the lubrication system is main-

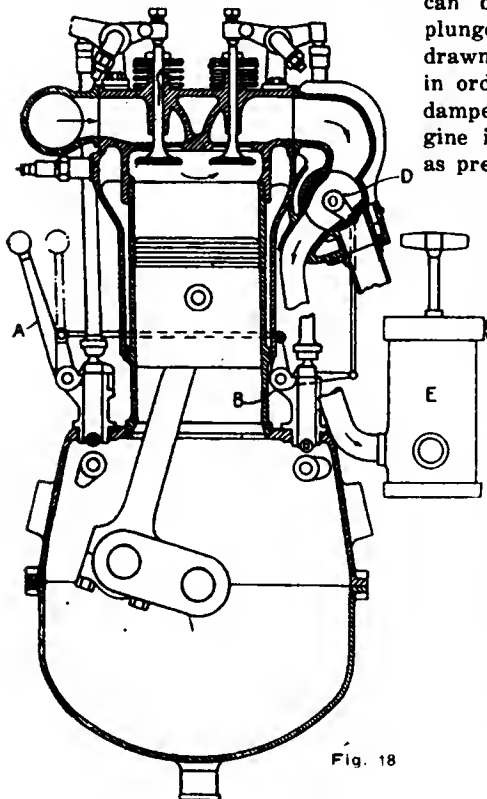


Fig. 17

tained, the dampers will be held off the jets, but if pressure fails, the piston will rise under the influence of its spring, and disengage the end of the plunger rod so that the latter will fly inward, and in so doing cause the jet dampers to cut off the fuel supply in the mixing chambers.

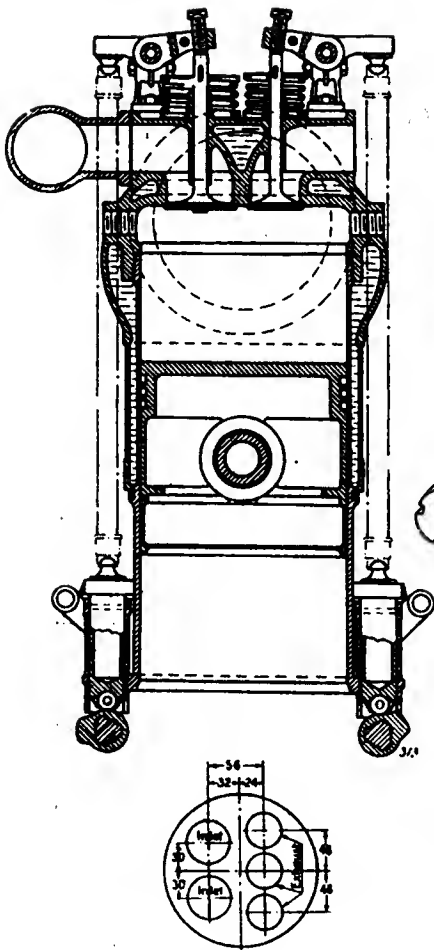
With regard to the triple piston valve contained in the circular distributor body, a section of which is given at the bottom of Fig. 15, this consists of a rod with three narrow

pistons mounted on it inclosed in a tube, in the circumference of which two grooves are cut, each groove being in communication with a port. The rod ends in a fork which engages with a small centrifugal governor driven by gearing from the crankshaft (see Fig. 16). The governor rotates the rod and can slide it to and fro against the action of a spring-loaded plunger, shown in the left of Fig. 15, which is carried in a case having a quick pitch thread on its circumference, and can be regulated by the lever as to its strength. The normal position of the piston valve rod is such that ports G and A communicate. As the speed of the governor increases, the tendency is to force the rod to the left, thus cutting off port A from port G, and putting port A in communication with the interior of the crankcase through the port C, so that the pressure behind the piston is released and the jet dampers brought into action. The port to the left of the piston valves prevents a dashpot action. It is probable that, although the governor may be set to cut out the jets when the engine exceeds a predetermined speed, yet between the definite jet cut off, or minimum oil pressure, and the maximum oil pressure, there exists a certain range, and it is to regulate or control the oil pressure within this range that the hand setting to the oil governor is provided.

**Starter Details**

With regard to the self-starter scheme, by means of the lever A on the inlet side of the engine, as shown in the diagrammatic cross section of the engine, Fig. 17, all the tappets are lifted off their cams by the small lifting cam B, the lip of which engages with the small triangular projection on the head of the tappets when the hand lever A is depressed. The details of this lifting mechanism are clearly shown in Fig. 18. All the valves, both the inlet and exhaust, are thus opened in the cylinder head, and at the same time the lever A, by a connection of levers, closes the exhaust passage to the muffler by partially rotating the water-cooled barrel valve or exhaust throttle D.

The exhaust ports and the outlet in the exhaust manifold are consequently in communication with the secondary outlet pipe that leads to a large suction hand pump E, by which gas is sucked into the cylinders from the two carbureters through all the inlet valves, as indicated in Fig. 17, showing the engine with all the valves open. When the cylinders are charged, the valves are returned to their normal positions by the lever A, and the valve D automatically opens the exhaust outlet to the silencer in the normal running position and closes the pipe leading to the suction pump E. Ignition is then effected by means of a geared-up Bosch hand-starter magneto.



Above—Fig. 19  
Left—Fig. 20

Normal ignition is by two Bosch magnetos—type 2H6—supported on a duplex bracket extension of the crankcase in front of the engine, the magneto being driven by spur gearing off the crankshaft bevel gear that also drives the water accelerator.

Two Bosch spark plugs per cylinder are fitted, one on each side of the cylinder, the plugs being screwed into the combustion chamber directly below the valves, as can be seen by reference to sketches 17 and 18.

The following are a few figures in connection with the engine:

Stroke/bore ratio	1.266:1		
Stroke volume of one cylinder	3.357.58 cu. cm.	204.8 cu. in.	
Total stroke volume of engine	20,145.48 cu. cm.	1,228.8 cu. in.	
Area of one piston	176.715 sq. cm.	27.40 sq. in.	
Total piston area of engine	1,060.29 sq. cm.	164.40 sq. in.	
Clearance volume of one cylinder	680.00 cu. cm.	41.48 cu. in.	
Piston speed	1,495 ft. per min.		
Brake mean effective pressure	107.4 lb. per sq. in.		
Cu. in. of stroke vol. per b.hp.	6.15 cu. in.		
Sq. in. of piston area per b.hp.	0.822 sq. in.		
Hp. per cu. ft. of stroke vol.	282 b.hp.		
Hp. per sq. ft. of piston area	175.4 b.hp.		
Area of inlet valve ports (each)	18.09 sq. cm.	2.80 sq. in.	
Total inlet valve port area per cyl.	36.18 sq. cm.	5.60 sq. in.	
Max. lift of inlet valves (h)	9.3 mm.	0.366 in.	
Area through each inlet valve ( $\pi d h$ )	14.024 sq. cm.	2.175 sq. in.	
Total area through inlet valves per cylinder	28.048 sq. cm.	4.350 sq. in.	

Gas velocity through inlet valve ports	122 ft. per sec.	
Gas velocity through inlet valves	157 ft. per sec.	
Ratio of piston area/area through inlet valves	6.3:1	
Area of exhaust valve ports (each)	9.621 sq. cm.	1.49 sq. in.
Total exhaust port area per cylinder	28.86 sq. cm.	4.47 sq. in.
Max. lift of exhaust valves (h)	7.88 mm.	0.310 in.
Area through each exhaust valve ( $\pi d h$ )	8.66 sq. cm.	1.342 sq. in.
Total area through exhaust valves per cylinder	25.98 sq. cm.	4.026 sq. in.
Gas velocity through exhaust valve ports	153 ft. per sec.	
Gas velocity through exhaust valves	170 ft. per sec.	
Dimensions of crank webs	96 × 25 mm.	3.78 × 0.98 in.
Bearing, flywheel end	90 × 66 mm.	3.54 × 2.60 in.
Projected area	39.4 sq. cm.	9.2 sq. in.
Other bearings (6)	64 × 66 mm.	2.52 × 2.60 in.
Projected area (each)	42.24 sq. cm.	6.54 sq. in.
Total projected area of crankshaft bearings	312.84 sq. cm.	48.45 sq. in.
Crank pin bearings, (each)	72 × 66 mm.	2.83 × 2.60 in.
Projected area	47.50 sq. cm.	7.36 sq. in.
Gudgeon pin bearing	110 × 33 mm.	4.33 × 1.49 in.
Projected area	41.80 sq. cm.	6.48 sq. in.
Length of connecting rod between centers	312 mm.	12.282 in.
Ratio of connecting rod to crank throw $l/r$	3.29:1	
Number and diameter of big end bolts	Four 14 mm.	0.551 in.
Diameter of camshaft	21 mm.	0.826 in.
		(diam. over splines)
Number of camshaft bearings	5	

WEIGHTS OF VARIOUS PARTS

	Kilos.	Lb.
Crankshaft, complete with camshaft drive pinion, bevel gear for driving water pump, and worm for driving cross-shaft for oil pump, etc.	45.00	99.208
Steel flywheel	30.40	67.02
Piston, complete with gudgeon pin and rings	4.92	10.84
Gudgeon pin	0.67	1.476
Connecting rod complete	4.895	10.78
Weight of reciprocating part of connecting rod	1.75	3.86
Total weight of reciprocating parts per cylinder	6.67	14.70

The following test results of the material employed in the engine are of certain interest.

The crankshaft steel gives Brinell numbers as follows:

Front web	No. 555 = 65 tons steel
Rear web	No. 321 = 72 tons steel

Tensile and impact pieces prepared from the cylinder holding-down bolt give the following:

Yield point	52.85 tons per square inch
Maximum stress	58.65 tons per square inch
Elongation on 1.41 in.	19.15 per cent
Reduction of area	52.6 per cent
Brinell hardness	No. 271
Impact	20.5 ft. lb.

A test from a portion of the aluminum crankcase gives the following:

Maximum stress	9.1 tons per square inch
Elongation on 2 in.	1.5 per cent
Elongation on 4 in.	1.25 per cent
Reduction of area	3.24 per cent
Bend through	.11 deg. broken

The following results were obtained on analysis:

ALUMINUM	
Zinc	12.34 per cent
Copper	1.06 per cent
Iron	0.86 per cent
Silicon	0.47 per cent
Aluminum	85.27 per cent
Inlet valve spring contains no vanadium.	
Exhaust valve: Vanadium present (percentage small).	

Use of Fused Silica for Engine Parts

It has been reported that fused silica has been employed in Europe for certain parts of aviation engines. The rumor is that cylinder heads have been made of this material, which, of course, has some rather remarkable properties.

Fused silica is somewhat unique in the way of materials, as although it is glass-like in appearance it is, in reality, very highly refractory, possessing at the same time the lowest known coefficient of expansion. As a comparison of its expansion coefficient, it is useful to compare it with glass, the exact figures being 0.0000085 for glass and 0.0000054 for fused silica, which makes the silica roughly 1/16 the expansion of glass.

The low coefficient of expansion is, of course, the underlying reason for the remarkable resistance of this glass-like product to changes of temperature, and nothing is more surprising than the usual laboratory demonstration of taking a piece of fused silica, making it white hot and then plunging it into cold water without breakage occurring.

The low coefficient, while an advantage as far as temperature resistance is concerned, is a positive disadvantage in making up composite metal and fused silica devices, as the metal parts expand and contract with changes of temperature, while the silica remains the same, despite the temperature changes.

# Removing Kerosene from Oil

Suggests Exhaust Jacket and Radiator for Lubrication System To Remove Dissolved Fuel—Possibilities of Oil for Cylinder Cooling—May Need Temperatures Above 212 Deg. Fahr. in Jackets

By A. Ludlow Clayden

**I**N this issue of THE AUTOMOBILE two contributors make mention of the possibility of running an engine with a jacket temperature in excess of 212 deg. Fahr., with the idea of obtaining better efficiency with kerosene fuel. Each suggests the possibility of placing a safety valve on the radiator and carrying such steam pressure as will serve to raise the boiling point of the water a few degrees. If these letters are straws to show the way the wind is blowing, and there is plenty of good reason so to regard them, all sorts of possibilities are opened up.

## Uses Oil Jacket

The Hall-Scott aviation engine is unique in that it has an oil jacket round the intake manifold, while using water in the cylinder jackets, thus cooling the oil and warming the gas proportionally, and there are now several cars in which provision is made for oil cooling. Still, neither the latter nor the Hall-Scott device provides an oil temperature control. The thermostat will easily control cylinder jacket temperatures accurately, and it could be adapted to control oil temperatures by giving the oil a separate cooling system modeled upon the water system, and it might be possible for the two ideas to be combined by using oil instead of water, the same body of lubricant serving in the bearings and in the jackets. The most obvious trouble is that oil for lubricating should be as cold as is consistent with requisite fluidity, while most oils are too thin at 200 deg. Fahr. or less.

## Oil Must Be Changed

With kerosene as fuel there is need for changing the oil with considerable frequency, because the kerosene condenses a little in the cylinders and, by dissolving in the oil, cuts down the lubricating power. Oil thus denatured can be restored by boiling off the kerosene or by maintenance of a temperature sufficient to evaporate the kerosene for sufficiently long, so it is conceivable that the crankcase oil might be continuously freed from kerosene by passing it through the cylinder jackets, having a sufficiently high thermostatically controlled temperature in the jackets.

These things are not *probabilities*, but

they are *possible* nuclei for the development of something practical.

Immediately temperatures higher than 212 deg. Fahr. are thought of there comes naturally the notion of the air-cooled engine. So far this has not been tried out to any extent for kerosene, and the writer is not aware of any accurate means for controlling the temperature of a motor of this sort within fine limits, although the principle of the thermostat must be perfectly applicable to air cooling. With an air-cooled engine the distillation of kerosene from the oil might conceivably be accomplished by passing the oil through a jacket on the exhaust pipe and cooling in an intake manifold jacket followed by passing through a small radiator perhaps, could restore the oil to its best lubricating condition before it was readmitted to the bearings. Again this is a purely visionary idea, very probably quite impractical.

## Elaborate Oil Cooling

Returning to the oil-cooled engine idea. Supposing a cooling system like an ordinary thermostat-controlled water system, we might add to it the exhaust jacket for keeping the oil free from light petrols in solution somewhat as follows: Oil could be taken from the bottom of the radiator, which would be much the same as the water radiator. This oil would be cool and could go straight to the bearings. From the crankcase sump a second pump could force it through the exhaust jacket, returning it to the top of the radiator in a hot condition, via an intake manifold jacket. Meanwhile the circulation through the cylinder jackets, controlled by a thermostat, could proceed independently. The only thing necessary to insure a supply of cool oil to the bearings would be a large enough radiator, and practically the only complication added would be the second pump for exhausting the crankcase. Just how fast and how frequently the oil needs to be heated up in the exhaust jacket is purely problematic.

In this connection reference may be made to some researches made in 1914 by Dr. Ormandy of Great Britain. Dr. Ormandy examined a large number of samples of used and unused lubricating oils and found in every case that the used oil contained light fractions which could

only come from the fuel employed. With respect to an oil heavily contaminated with kerosene, he suggested that heating combined with agitation at about 300 to 400 deg. Fahr. ought, in the light of his experiments, to restore the oil to its original condition. Such heating would be easy in an exhaust jacket.

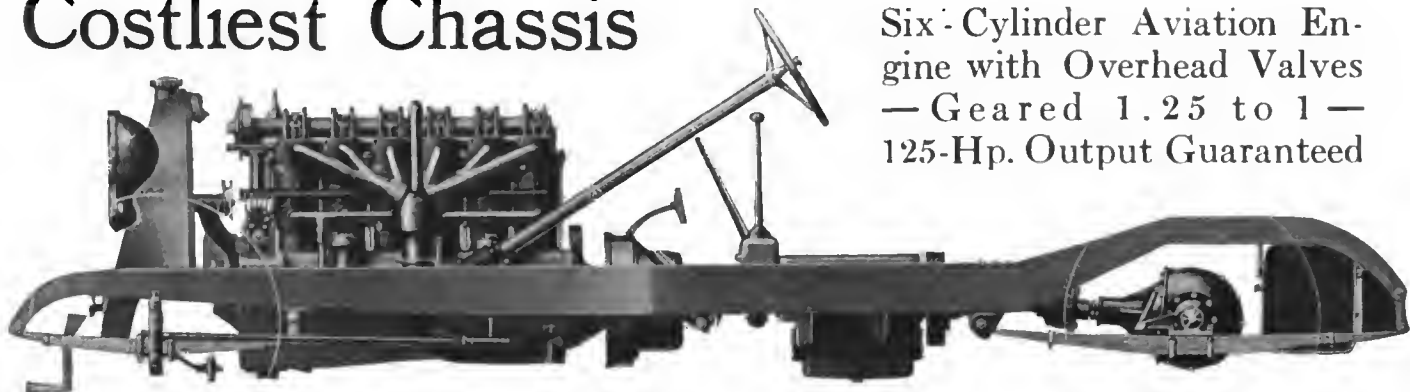
## Must Keep Oil Pure

The writer has hesitated a little in making what seems at first sight to be so extraordinary a suggestion and would point out that he has not the passenger car so much in mind as the tractor, of which the lubrication troubles were so expressly mentioned by W. L. Horning in his recent S. A. E. paper. On a tractor the big radiator which would probably be necessary in connection with so comparatively poor a heat carrier as heavy oil, would be no serious disadvantage. Even if water or air cooling was used for the cylinders, the extra complication of the "oil boiler" and oil radiator might conceivably be worth while.

There is just one thing certain, and this is that we are not going to be able to run the ordinary engine on kerosene without some means for keeping the oil free from contamination. It is also highly probable that a temperature above 212 deg. Fahr. will be found to give the greatest economy. Yet again we need to have the valves as cold as possible and the spark plugs similarly well cooled. The conditions are antagonistic, they exist to some extent in a gasoline engine, but it is possible to strike a happy mean with gasoline so that the conventional water and oil systems are quite efficient enough. Of course, we may find that kerosene can be handled by purely mechanical means so that deposition in the cylinders is completely prevented, either by vaporization or atomization, and then the conventional oiling system will be satisfactory. At present, however, we do not seem to have discovered how to prevent a steady thinning down of the oil in tractor engines which, incidentally, being always at full throttle, are working under the condition where condensation is least aggressive. If tractor engines were required to run much at low throttle the use of kerosene with a recirculatory lubrication system would probably be very nearly impossible.

# 130-Hp. Fageol Is America's Costliest Chassis

Six-Cylinder Aviation Engine with Overhead Valves  
— Geared 1.25 to 1 —  
125-Hp. Output Guaranteed



IT has been demonstrated on numerous occasions that the employment of a high-speed, light-weight aeronautical engine in an automobile chassis makes an ideal combination where performance alone is considered. Hitherto combinations of this kind have been merely of an experimental nature. There is now on the market, however, and will be on exhibition at the Chicago show, a chassis of this kind which is a stock job. It is the product of the Fageol Motors Co., Oakland, Cal., and sells in chassis form at \$9,500. Any body work in connection with the chassis is additional and is, of course, optional with the purchaser.

The engine employed is the Hall-Scott aviation power plant. The class of service for which an engine of this type is adapted may be shown by a recent test in which this six-cylinder unit was run continuously for 64 hr. at 1300 r.p.m., developing 130 b.h.p. The weight of the engine is 560 lb., and it is guaranteed to produce 125 hp. at 1300 r.p.m. This is a horsepower for every  $4\frac{1}{2}$  lb. of engine weight and for every 6.6 cu. in. of piston displacement. The total piston displacement is 824.67 cu. in.

Like the majority of aviation engines which are being turned out at the present time, this is an overhead-camshaft type. It is not a V-engine, however, but a vertical design of six cylinders, having a bore and stroke of 5 by 7 in. The cylinders are cast separately, but are machined on the sides so that when assembled they form a solid block and to all appearances are block cast. The material for the cylinders is Swedish gray iron.

## Swedish Iron Pistons

Swedish iron, known frequently as semi-steel, is also used for the pistons. These are made very light, but with the necessary strength and rigidity secured by a system of deep ribbing under an arched head. There are six of these deep ribs, which not only help in strengthening the pistons but serve to carry the heat away from the piston head. The piston pin bosses are located rather low on the piston to keep the heat away from the upper connecting-rod bearing.

Solid chrome-nickel-steel forgings are used for the connecting-rods, with a gunmetal bushing at the piston pin end and a double bronze bushing carried in serrated shells at the crank end. These bronze shells are tinned and babbitted while hot. Adjustment is provided by placing laminated shims between the cap and the rod. To keep the rods light they are milled and machined all over.

A seven-bearing crankshaft is used machined from a heat-treated drop forging of chrome-nickel steel having a tensile strength of 275,000 lb. per square inch. The diameter of the shaft at the bearings is 2 in., and all but the front and rear bearings are  $1\frac{15}{16}$  in. long. The rear main bearing is  $4\frac{3}{4}$

in. long and the front main bearing is  $2\frac{3}{16}$  in. The timing gears and starting pinions are bolted to a flange which is turned integral with the shaft.

## Overhead Valve Operation

From the crankshaft the valve drive is carried to the overhead camshaft by means of a vertical shaft in connection with bevel gears. The camshaft is inclosed in an aluminum housing bolted directly to the tops of the cylinders. It is a one-piece design with the twelve cams integral, and the flange through which the shaft is driven is also an integral part of the forging. The material used in the shaft is low-carbon steel with a small nickel content, and the shaft is carried on four large bearings, each lined with Parsons white brass. The valves are operated by short chrome-steel rocker arms, with hardened steel roller followers on the cam end and tool-steel adjusting screws on the opposite end. The diameter of the valves is quite large, being  $2\frac{1}{2}$  in., or one-half the cylinder diameter. They are seated directly in the cylinder heads, fitted with large-diameter springs held in tool-steel cups, and locked with a key through the valve stem. The valve ports have been kept large in proportion with the valves, giving free inlets and outlets for the gases. The material used for the valves is tungsten steel.

Both oil and water are used in the cooling system. The oil is circulated around a long intake manifold jacket, helping keep the crankcase heat at a minimum at all times and warming the intake. Uniform temperature of the cylinders is maintained by the use of internal outlet pipes running through the heads of each of the six cylinders. Slots are cut in these pipes so that the cold water is drawn directly around the exhaust valve. Surrounding the cylinders, the water jackets are large, with 2 in. of water space being left above the cylinder head. The water circulation is maintained by a centrifugal type of pump.

## High-Pressure Oiling

High-pressure oiling is used, with a large gear pump located in the oil sump in the bottom of the crankcase. The oil is first drawn from the strainer in the oil sump to the long oil jacket around the intake manifold, and then forced by pressure, which varies according to the motor speed from 5 to 30 lb. to the square inch, to the main distributor pipe in the crankcase. On the crankshaft there are pinned steel oil scuppers which carry the oil to the lower connecting-rod bearings. The camshaft-drive mechanism is oiled by forcing the oil into the front end of the shaft, allowing the shaft itself to act as a distributor, and the surplus oil flows back to the crankshaft through a hollow vertical tube located at the rear of the crankcase housing. This supply also oils the magneto

and pump gears. Aluminum alloy is used in the construction of the crankcase, the lower half of which can be removed without breaking any of the oil-line connections.

**Two Magnetos Furnish Ignition**

For ignition two six-cylinder magnetos are used mounted on the opposite ends of a cross-shaft at the forward end of the engine. This gives two independent ignition systems with independent spark plugs, so arranged that one system can be completely out of commission without interfering with the functions of the other. A double Zenith carbureter with a single float is used with the unique feature mentioned, that the jacketing around the carbureter manifold is filled with the warm crankcase oil, thus serving to aid in the vaporization of the fuel as well as to reduce the heat of the crankcase. The arrangement of the intake manifolding should be noted. This is shown in the view illustrating the right side of the engine, and it indicates the jacketing connections with the double carbureter and the balanced form of intake manifold.

Referring to the chassis views, it will be seen that the engine is mounted on a subframe which is extended back to carry the gearset and clutch. Behind the gearset the length of the driveshaft is exceedingly short. The greater part of the distance between the rear axle and the engine is taken up by the clutch housing and by the transmission members. The clutch is a Hele-Shaw of standard form, with regulation V-grooved twin plates of phosphor-bronze operating against steel plates in a bath of oil. This is inclosed in an oiltight housing back of the flywheel, and connects with the main shaft of the gearbox through a universal coupling.

The gearbox is entirely a Fageol design mounted in a bronze and aluminum case cast in three parts. The box provides three speeds forward and reverse, and the ratios are such as to provide 5 to 1 on first, 2½ to 1 on second, and 1¼ to 1 on third. The novel feature of the case is that the main box and the supporting arms are of manganese bronze and so arranged that the main shaft and countershaft, mounted one above the other, are just half within the case, as shown in the illustration. Manganese bearing caps are put in a position completely encircling the bearings. Chrome-nickel studs extend vertically through the aluminum case, taking up twisting and torsional stresses.

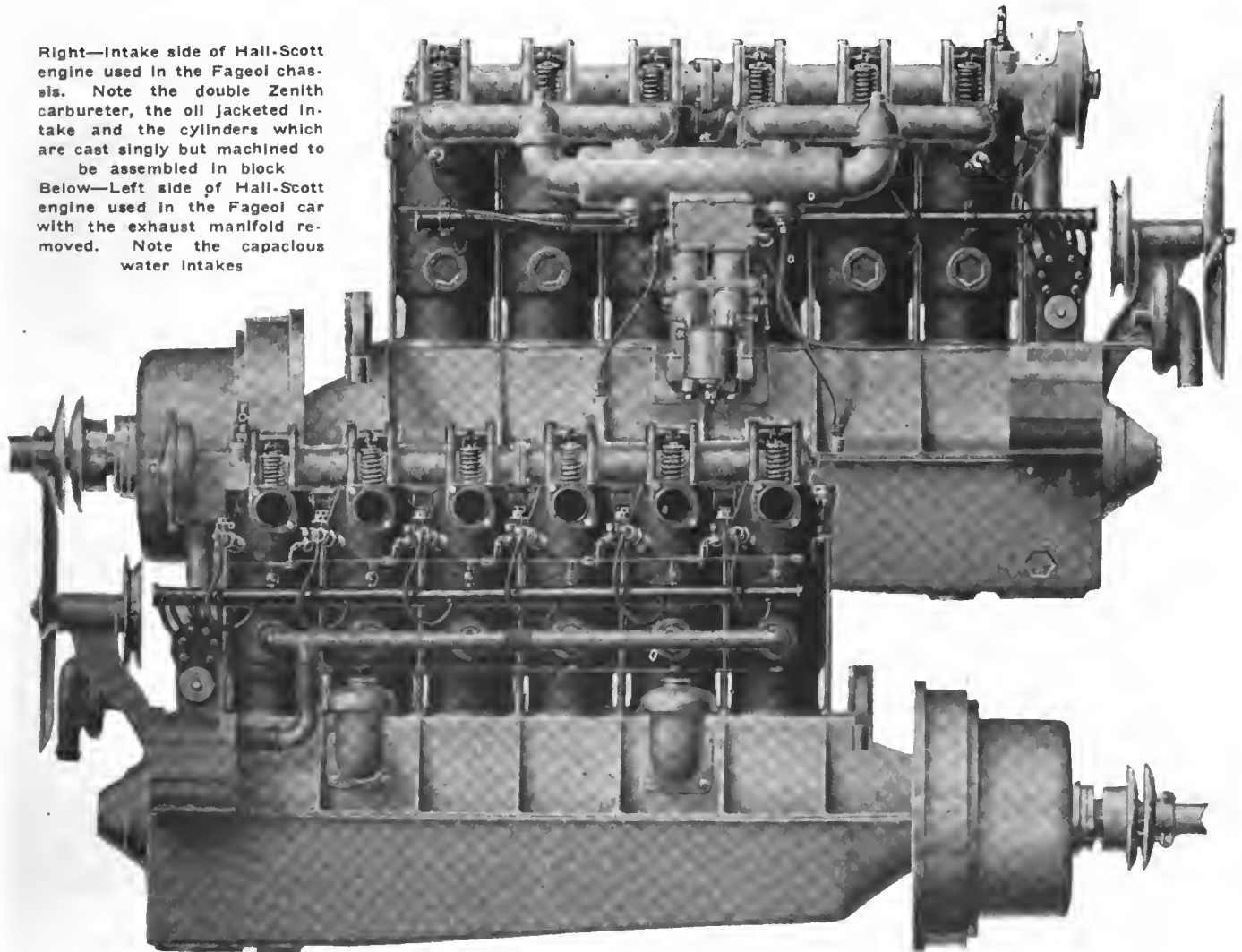
**Gears and Bearings Accessible**

The upper section of the case is cast integrally with the brackets and forms a housing for the shifter lever, shifting mechanism and emergency brake lever. The object of this form of case is to permit a thorough inspection of the gears and bearings by simply removing either the upper or lower section of the case. Chrome-nickel-steel shafts and gears and annular ball bearings are used throughout.

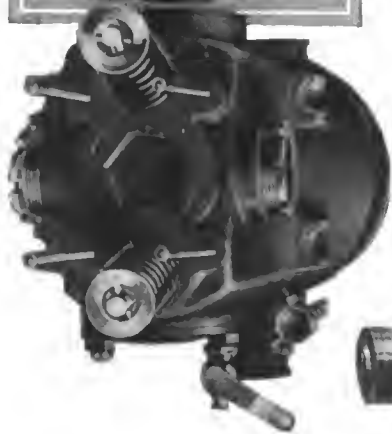
A semi-floating rear axle is used, with the shafts carried on Bock taper roller bearings and with chrome-nickel steel used for the driving members. The front axle is an I-beam drop forging from chrome-nickel steel. The brake layout has been given particular attention, with the foot brakes mounted on 16-in. ribbed drums bolted on the rear wheels and the hand brake operating against the 12-in. ribbed drum on the main transmission shaft just back of the gearbox. The springs are semi-elliptic, and also of chrome-nickel steel.

Alloy pressed steel is used for the chassis frame. This is

Right—Intake side of Hall-Scott engine used in the Fageol chassis. Note the double Zenith carbureter, the oil jacketed intake and the cylinders which are cast singly but machined to be assembled in block  
Below—Left side of Hall-Scott engine used in the Fageol car with the exhaust manifold removed. Note the capacious water intakes



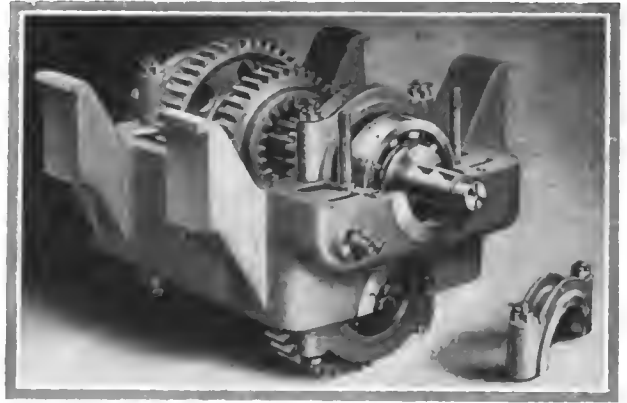




One of the single-cylinder castings of the Hall-Scott engine showing the valve position



Left — Piston and connecting-rod assembly as used in the Hall-Scott installation in the Fageol chassis



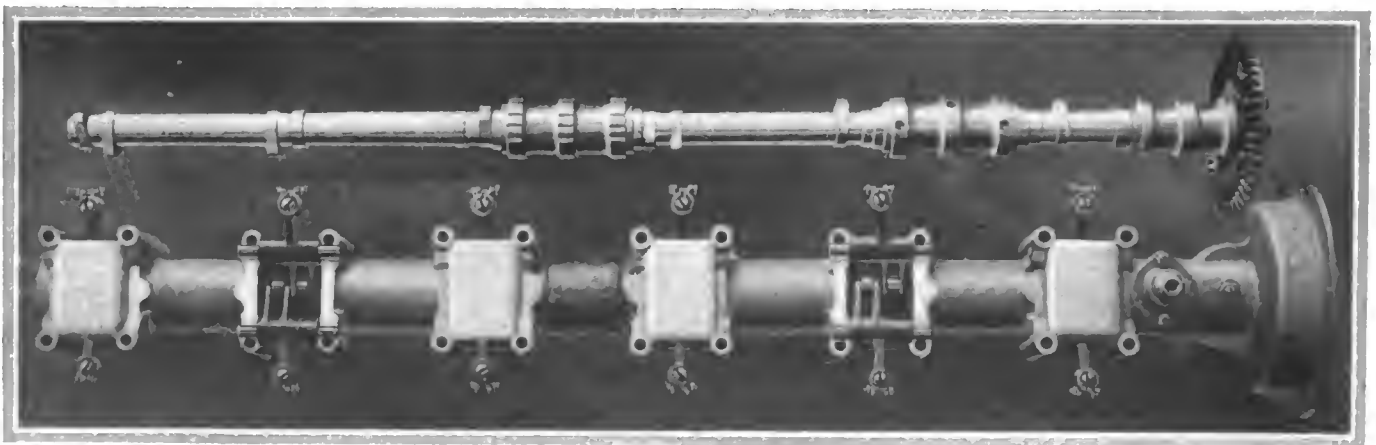
Above—Built up gearbox of manganese bronze and aluminum designed to give the maximum accessibility for the gearbox assembly



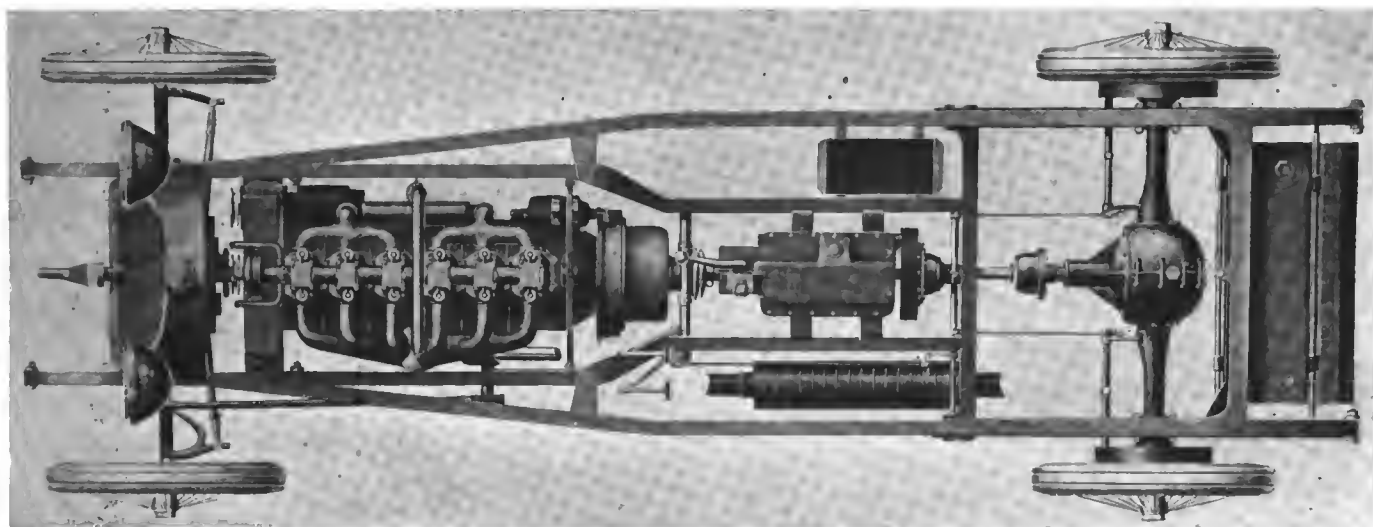
Aluminum crankcase, showing the liberal dimensions of the seven main bearings and the direct high pressure oil leads



Semi-floating rear axle with single brake drums used on the Fageol chassis



Camshaft and camshaft housing showing the method of supporting the rocker rods on the Hall-Scott engine.



Fageol chassis, showing unusual tapered frame and elaborate subframe construction with tilted radiator. Note transmission brake

a special design best understood by a study of the plan view of the chassis given herewith. The side rails are 2 in. wide and 6½ in. deep, with the forward end narrowed down to 29 in. to permit of easy turning. The main sills of the frame are directly under the main sills of the body, with the front and rear springs directly under the main-frame members. The wheelbase is 135 to 145 in., according to the body model desired.

A feature of the radiator is that it is carried on a slant of 15 deg. This is not only for appearance, but greater cooling efficiency is claimed, because the air is forced through the radiator with greater friction than is possible with the vertical type. The steering gear is especially built for the Fageol car, and is bolted directly to the subframe, with the bell crank extending directly through the subframe member. A secondary support is secured in the aluminum dash, which provides for adjustable rake of the steering column to fifty individual requirements.

**Quadrant Levers Ivory Mounted**

Left drive is used, with the steering gear directly in front of the driver and the control levers designed to be in such a position that the driver will naturally drop his hand from the steering gear to the emergency brake or the gear-control lever. Ivory mounting is used for the levers in the quadrant, which is at the center of the wheel.

Starting and lighting is by a 12-volt system, with the headlamps mounted on the radiator. The engine is illuminated by two special lights when the bonnet is raised, and the tail-light is so designed as to particularly throw the light on the rear license plate.

Copper is used for the 25-gal. gasoline tank, the material being formed from twelve-gage sheeting and the tank fitted with a magnetic gage indicating the extent of the gasoline supply. The wheels are wire, with plain clincher rims and fitted with 34 by 4½-in. cord tires. Two complete spare tires and wheels are provided.

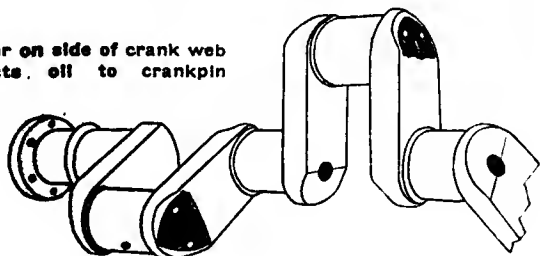
One or two features about the bonnet are exclusive, par-

ticularly the ventilation, which is protected by patent applications. There are six triangular curved ventilators which are designed to clean out the air beneath the hood. These projecting ventilators start with a line flush with the top of the hood and tilt upward and backward for a length of 6 in. The rear opening may be closed at will with a waterproof door controlled by a lever on the dash, making the hood entirely waterproof. Another individual feature on the bonnet is the use of vault lock latches. The handles of these are ivory and the latches are always under spring tension to prevent rattle.

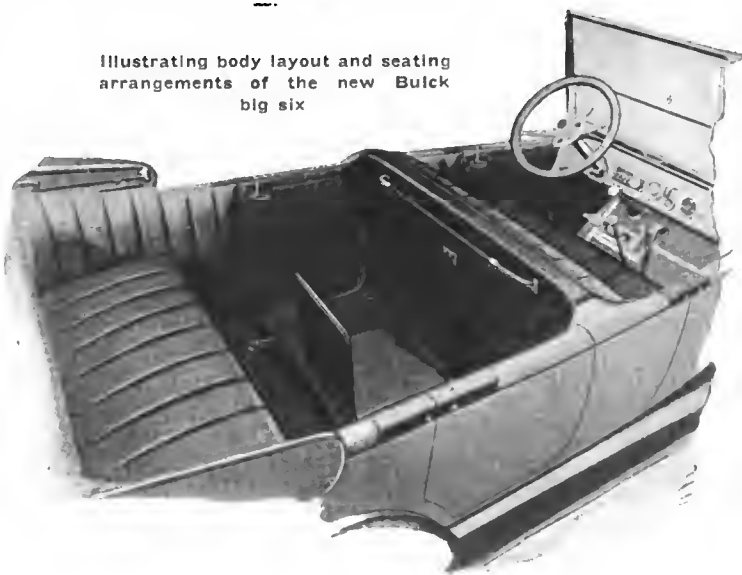
**Other Special Features**

The instrument board is also patented, and is in the form of a single panel through which the recording hands of the different instruments extend and over which a single piece of plate glass is fitted. The windshield is a special design and is claimed to be entirely rainproof. The glasses lap over each other by 3 in. when they are entirely closed. At the back of the body there is a substantial luggage carrier made of bronze and brass, hand-finished and nickel-plated. All the tools are made of high-grade steel, and nickel-plated socket wrenches are provided to fit every bolt in the entire engine and chassis. The tools are mounted in flush-line receptacles, and when the tool-box lid is opened a table is formed with all the tools in their places and ready for use; the box is designed so that it is automatically lighted.

Catcher on side of crank web conducts oil to crankpin



Illustrating body layout and seating arrangements of the new Buick big six



# Winter Warfare Difficult for Cars and Trucks



1—Speeding to the rescue of the survivors of the Tora, a liner sunk by a submarine off the north coast of Africa. One of the Duke of Westminster's armored cars following the Duke while crossing the desert in this expedition

2—An Austrian truck stuck in the mud on the Serbian frontier had to be extracted from its predicament by fifty soldiers

3—French staff officers' convoy held up by a snow blizzard on the heights of the Meuse during the Verdun fighting. Car after car broke down in holes made by shells but which were hidden by the level snow. The officers are trying to keep warm while the chauffeurs work on effecting temporary repairs to their cars

Photographs by Underwood & Underwood



4—German staff officers pushing their car, which has become mired in the muddy Serbian roads. Owing to recent incessant rains, roads in this section are in a terrible condition and cars sometimes founder beyond redemption in the mud

5—One of a convoy of French motor trucks having difficulty in the deep snow and mud on the heights of the Meuse. It is necessary to proceed cautiously in this neighborhood, as shell holes in the road are hidden by the snow

6—A British army service corps motor truck which skidded off the road into a ditch just behind the firing line in northern France

7—A line of German army trucks held up in a hurried race to the firing line in northern France by one of the number sinking deeply into the mud which characterizes the roads in this section, now badly broken by heavy traffic and wintry weather



# Improved Church Fuel Feed

## Automatic Discharge Water Trap Incorporated in Pressure Line—Design Simplified in Many Details

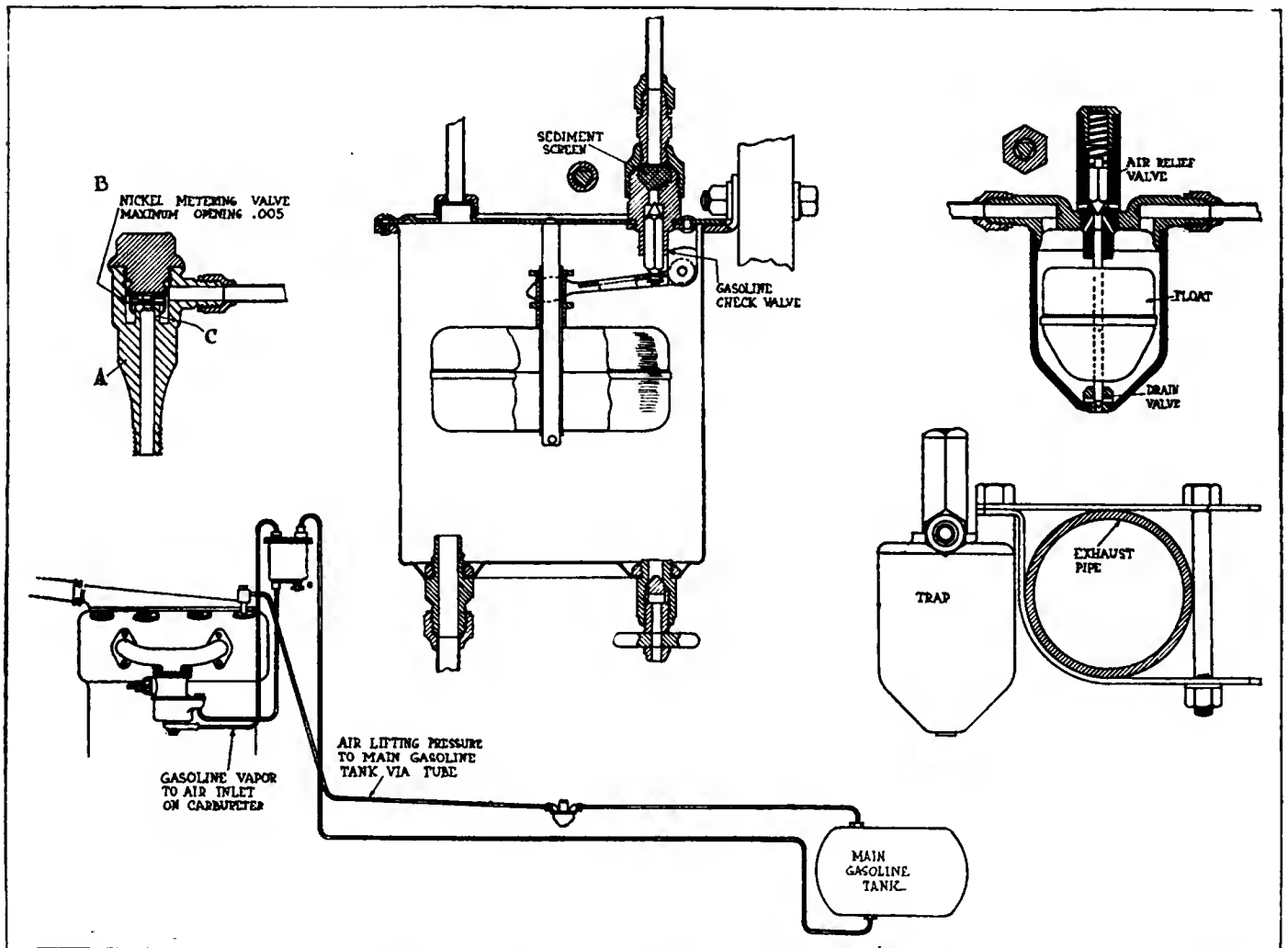
IT will be remembered that the Church fuel feed system, announced during the Fall of 1916, takes pressure direct from one of the combustion chambers of the engine and uses it to lift gasoline from a rear tank to a supplementary tank, whence the feed to the carburetor is by gravity. Since its first introduction the system has been improved in detail and now includes some very ingenious devices, of which the automatic discharge water trap is foremost.

As part of the products of combustion is water, it is necessary to catch this before it can reach the main fuel tank. Therefore a trap is placed in the pressure line, the details of this being fully made clear in the sectional drawing. However, a trap of this sort needs to be emptied when a sufficient amount of water has collected, and since the driver might neglect to perform this operation it is made automatic in the new Church system. The trap chamber contains a float which controls a needle valve at the bottom and, when a sufficient amount of water has collected, the float lifts the valve, allowing the water to escape.

Here occurs another ingenious idea. The water collecting

in cold weather is liable to freeze, and if it does so the float cannot act, and the whole trap may get filled with ice. To counteract this the trap is provided with clips that attach it to the exhaust pipe, where it is kept well above freezing temperature. The pressure release valve is combined with the trap assembly, and the warmth is beneficial to this also, as it prevents the accumulation of gummy oil as might happen with an over lubricated engine. In the section of the trap the water valve is seen at the bottom and the pressure release valve at the top of the chamber.

The supplementary fuel tank which supplies the carburetor by gravity, is also shown in the cut. Fuel enters at the top and the supply is cut off when the float rises enough to close the valve in the cover. Immediately back of this valve there is a screen for removing impurities from the gasoline. To allow the gravity feed it is necessary that there be an opening at the top of the tank to admit atmospheric pressure, and through this opening a certain amount of gasoline vapor might escape, thus causing waste. To prevent this the top opening is connected to a copper pipe that is carried down



Details of the Improved Church gasoline feed system, showing use of automatic discharge water trap, as well as layout of the system in connection with an engine, details of water trap, section through fuel tank and also through metering valve

to the air intake side of the carbureter; causing any escaping vapor driven off by the heat within the hood of the car to pass in with the entering air and so be consumed within the cylinders together with the rest of the explosive mixture.

The pressure valve that is attached to the engine possesses a great simplicity. The body A is bored out at the top so that there is left an upstanding piece C, like the cut off end of a tube. On top of this rests a nickel-steel disk B kept in place by the little cage that is shown surrounding it. With the explosion and the compression strokes the valve lifts a maximum distance of 0.005 in., allowing some gas to pass

into the pressure line, the release valve on the side of the exhaust pipe being set to blow off at about 1 1/2 lb. per sq. in.

The feed is, of course, not affected by throttle position. As long as the engine is running there is a more than adequate supply of pressure, and the gravity tank contains more than sufficient for starting up. It is essentially an exhaust pressure system with all the drawbacks removed. It is simpler than the air pressure system that calls for a pump on the engine, and it is claimed that it can be made smaller and lighter than an equally efficient system that depends upon depression in the inlet pipe for power to lift the fuel.

## Conveyor Cuts Overland Export Expense

**T**HE Willys-Overland Co., Toledo, has installed a number of machines designed to facilitate export shipment and to increase production. Export shipments, formerly requiring a number of workers who carried the boxed automobiles from the shipping room to the waiting freight cars, are now performed by means of a large electric crane.

The crane runs through an overhead groove conveyor, approximately 500 yd. long and constructed in a circle. The operator sits in a small box-like compartment, somewhat similar to the cab of a locomotive, and is situated directly below the steel frame of the crane. After the automobile has been disassembled and packed in a large wooden box, steel chains on the crane mechanically grasp it and the engineer, by means of his motor, carries the box to the freight car outside of the building, deposits it and returns on the circular conveyor to the shipping room. The appliance has effected an important saving of time and labor, besides insuring more careful handling with a consequent decrease of damage to the box and automobile.

The company has also installed in its factory three Gisholt automatic machines, which eliminate considerable labor. The machines are watched by one worker, whose sole duty includes the setting of raw flywheel castings and the removal of them after they are finished. Each machine performs twenty-six operations in 14 min. by means of a number of

tools, which comprise knives, polishers, reamers and bores. When the flywheel is set for the automatic operations it weighs 100 lb. When it is removed the weight is 76 lb., 24 lb. having been eliminated by the work performed on it.

Another new machine, used for drilling holes in raw crankcase castings, drills eighty-one holes in 10 sec. This machine covers 19 sq. ft. of floor space, with 7 sq. ft. of working space. The worker places the raw casting on a roller wheel conveyor, wheels it to the first part of the huge machine, and turns the casting over automatically into the machine so that it is ready for the drilling.

### Cementing Tires Before Building

**I**N cementing tires before building, in vulcanization work, three coats should be applied. The first coat should be thin because it is a priming coat, just as in painting a building. The priming coat must get into the pores to form a foundation for the succeeding coats, and a thin application serves this purpose best.

The first coat should be brushed in thoroughly and allowed thirty minutes to dry. The second coat should be 50 per cent heavier and given the same time to dry. The last coat is a light one and should dry from 3 to 5 hr., according to atmospheric conditions.—*Goodyear Tire News*.

Below the new electric crane at the plant of the Willys-Overland Co., Toledo, is illustrated picking up a box containing an automobile packed for export shipment preparatory to moving it to the waiting freight car

At the left the crane is shown swinging the box containing the automobile into the freight car for the first stage of its long journey to a foreign land



# Low Velocity in Ensign Carbureter

Dimensions of Smallest Part of Intake Equal to Manifold Size—Same Instrument Claimed to Use Gasoline Distillate or Kerosene with Small Modification

By A. W. Ensign

*Editor's Note—It is not the policy of THE AUTOMOBILE to accept from manufacturers descriptions of their product that might be considered to be of an advertising nature. Mr. Ensign's letter, however, is so especially interesting, and the nature of his carbureter is unique so that our rule is waived for this instance.*

**R**EFERRING to the very interesting article on carbureters appearing in THE AUTOMOBILE for Dec. 15, I wish to call attention to the fact that it is difficult to place the Ensign carbureter in any of the divisions used in those articles in classifying carbureters.

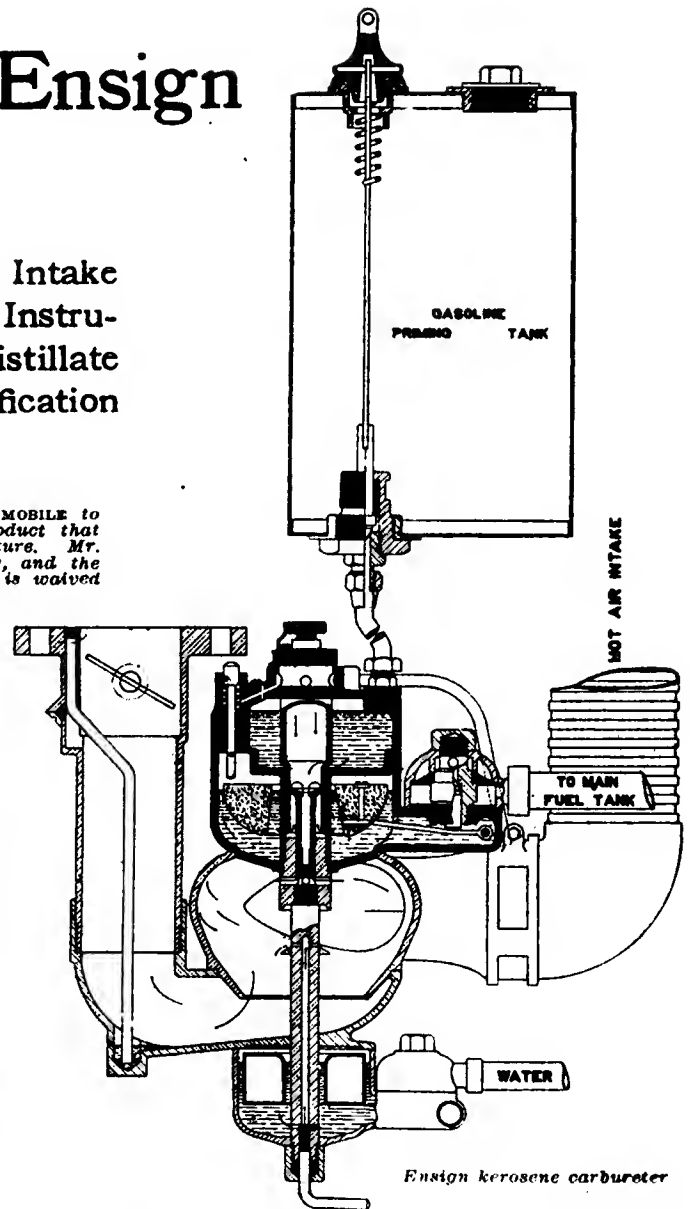
In describing the method by which the different classifications were arrived at these statements are used: "At the same time this main jet or primary device which supplies the engine at low speeds must play its part in wider throttle openings. The ways in which this compensation is made may be classified as follows: Side Valve, Metering Pin, Compensating Jet, Expanding and Miscellaneous Types." The writer then classes the Ensign with the air-valve type.

The vortical action of the mixing chamber of the Ensign carbureter is depended upon to create the right proportion of fuel and air at all speeds and is only slightly modified for the extreme low idling speeds. This is accomplished by an unbalanced butterfly valve free to swing on a shaft passing horizontally through the axis of the air inlet horn.

The butterfly is a flat circular plate fitting loosely in a finished cylinder with enough of the top cut away parallel to the horizontal axis around which it swings to give the desired result. The diameter of this air inlet horn is enlarged where the butterfly is suspended so that the velocity affecting this butterfly is one-half that in the intake manifold. The butterfly is so constructed that at engine speeds corresponding to car speeds of from 7 to 12 m.p.h. it lies horizontal, so that at all normal working speeds it cuts the air at one-half manifold velocity as a knife edge. In fact, remove it wholly from its position at the point where it is most effective and it does not change the vacuum in the mixing chamber more than that due to a water column  $\frac{1}{4}$  in. high. This device for effecting the mixture at extreme low idling speeds plays no part in forming the mixture at any working speed. It can be, and is, left out on a large percentage of engines and is never used with distillate or kerosene where heat is required. No heat is ever used in connection with this carbureter for any grade of gasoline so far encountered. Therefore, this carbureter cannot be classed with the air valve type, because the air valves in all others so classified are a factor in proportioning the mixture at all speeds.

## No Jets Used

There are no jets from the float bowl. Suction, produced at the center of the mixing chamber by centrifugal force and acting on the whirling air body, is communicated to a suction chamber within the float bowl through a stand pipe or suction tube projecting above the fuel level in this suction cham-

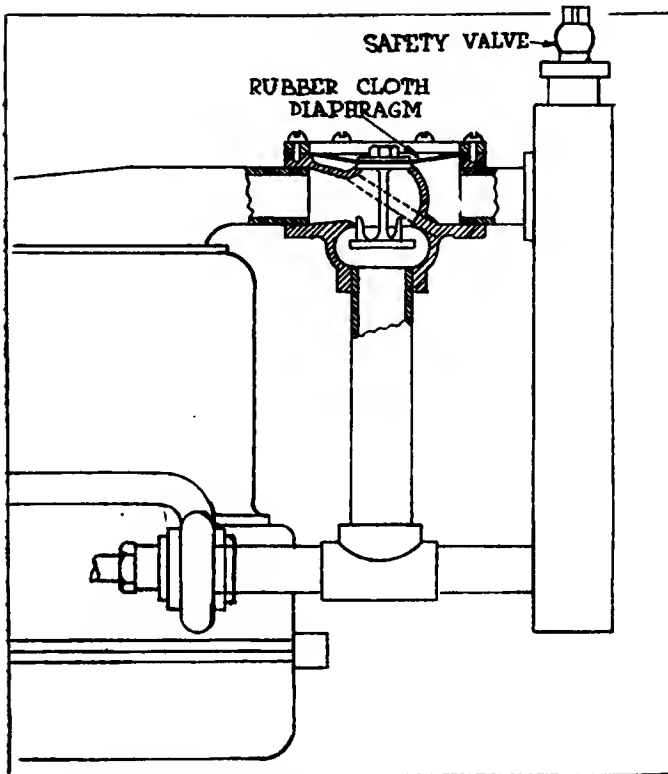


ber. A fuel orifice in the wall of the suction chamber allows fuel under the suction therein to enter the chamber and thus overflow down through this stand pipe to the mixing chamber, where it is acted upon by the whirling mass of air.

The fuel orifice is submerged, consisting of a hole about  $\frac{1}{16}$  in. in diameter through a wall less than  $\frac{1}{16}$  in. thick. This allows instant acceleration and prevents clogging from fine particles floating in the fuel or material in solution being left in the opening on account of partial vaporization as in a nozzle. This orifice is adjusted by cutting off one side of the hole as by means of a shutter, leaving a relatively large free opening.

## Only Two Adjustments

The suction on the orifice is also adjusted by the control of a small valve lifted by the partial vacuum in the suction chamber. This valve allows a slight leak of air into the suction chamber immediately above idling speed. The amount of air thus admitted is infinitesimal and is proportional to the main air at all speeds. Both these adjustments are mounted on the same piece on top of the float bowl, thus there are only two milled nuts close together for the whole range of adjustments. In the standard carbureter, the *smallest* opening in the air or mixture path through the carbureter is equal in area to the engine manifold and therefore gives the same



Radiator outlet control arranged to maintain jacket temperature above 212 F.

line and kerosene results. In summer, one charge is enough; in winter, two or three may be necessary before the engine will be warm enough to operate on kerosene alone.

The writer's experience in operating with kerosene has brought out some very definite points that are essential to success. Owing to the viscosity of kerosene when cold, it is not easily broken up without heated air; 185 deg. Fahr. has been found sufficient for all purposes, but this temperature must be sustained beyond the carbureter, hence intake manifolds must be heated to at least that temperature. In short connections to cast-in manifolds water jackets may suffice; but for exposed, large intake manifolds exhaust gases must be used and means for controlling the temperature provided to suit weather conditions. If heated to more than 200 deg. Fahr., loss of power will occur. Most important of all, the cylinder wall temperature must be sustained above 185 deg. Fahr., preferably about 212 deg. Fahr. at sea level.

The most effective method of doing this is to close the circulating system tight against pressure of 1 lb. per square inch, provide a by-pass from top of engine block to pump suction, cutting out the radiator; control this by-pass by a valve operated by a diaphragm with one side exposed to the air and the other to the vapor pressure in the closed circulating system.

In starting a cold engine, water circulates in the water jackets only, and when water begins to arrive at the top at the boiling point before bubbles of steam can form in the jacket space the pressure of water vapor will lift the valve and cause just enough water to pass to the radiator to hold it constant to within one degree of the desired temperature. If the water stands above the diaphragm a few inches in the radiator, and the valve is then closed by spring tension, regulation of the spring pressure will allow temperature control at some point lower than that due to the boiling point at the prevailing atmospheric pressure or can be set at boiling point or slightly above. A small quantity of a fluid of a lower boiling point added to the water would again give a new temperature.

**Water Used with Kerosene**

A water float bowl is provided on the carbureter for kerosene to control pre-ignition. It is placed below the carbureter with a needle valve adjustment and is so arranged it cannot come into action in starting or idling but does come into action at about one-third load. With this carbureter properly installed, any fuel distilled from petroleum of 40 gravity or over can be used. To use gasoline it is only necessary to remove the hot air connection and exhaust from the intake manifold and put gasoline in the tank, when generally no re-adjustment is required.

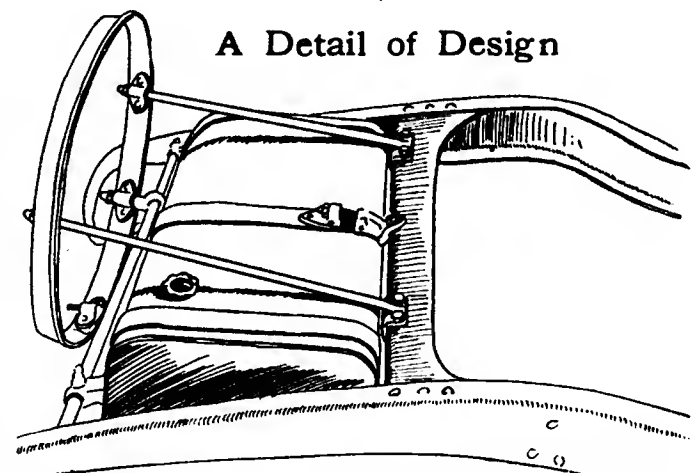
velocity. The only element depended upon for proportioning the mixture and reducing it to an atomized vaporized or fogged condition is the shape of the mixing chamber.

The pressure drop in the center of the vortex mixing chamber is near enough proportional to the square of the rim velocity to give the correct mixture at all speeds, and this drop of pressure at average and high speeds, combined with the whirling action, breaks up the fuel to a degree of extreme fineness. This is better understood when attention is called to the fact that the body of air in the mixing chamber rotates at higher than 10,000 r.p.m. at full load with manifold velocity at 150 ft. per second. At starting and idling and slow speeds, the whirling air only performs the function of a centrifugal pump impeller pumping into the mixing chamber the correct amount of fuel which falls to the sump at the bottom where it is drawn by the vacuum above the throttle through the by pass tube along with some air; entering the manifold as a vapor, or as finely atomized spray in the case of distillate or kerosene.

**Easy Start from Cold**

This design of carbureter makes it possible to start a cold engine and to get nearly full power immediately because, when the throttle is opened, the violent action in the mixing chamber provides a fog from the fuel and air that is not dependent on heat or a vacuum. It idles slowly with a cool engine without a separate jet from the float bowl because the fuel does not have to be lifted through a mixing chamber at low velocity from a fuel jet to the throttle valve, but drops by gravity to the bottom and is therefrom lifted by the vacuum above the throttle. Hence, none of the choking devices are necessary and are not in the way of a free flow of air or mixture at high speed and power.

To adapt this carbureter to the use of kerosene or other heavy distillates, a chamber for receiving a definite limited charge of gasoline is substituted for the float bowl cover. The gasoline, immediately on charging this chamber, begins to flow by gravity to the sump at the bottom, and the first four or five explosions of the engine are on gasoline. Then, until the chamber is exhausted, a mixture of 1 to 6 of gaso-



Rear of Haynes chassis showing unique method of bracing spare tire carrier. This gives a light yet rigid construction



# Easy Ability Testing

Simple Methods Show Car Condition or Permit Ready Comparison—Determining Grade Accurately By Eye—Required Tools Speedometer and Stop Watch Only

By Charles E. Manierre

UNTIL quite recently there appeared to be no inexpensive method by which the ability of the engine and condition of the car could be tested with any exactness except by the manufacturer. The experienced driver could tell in a general way whether the car was up to its usual capacity or not, but the the most that he could say was that it was either running very well or that it needed attention. Fortunately it now requires little in the way of scientific knowledge or of scientific instruments to enable one to make a fairly accurate test of the ability of his car.

### Basis Is 10 m.p.h. Variation

This article is written chiefly for the benefit of those who have at least a slight understanding of the meaning of a "rolling resistance curve," (which throughout this article will be deemed to include wind resistance,) and of a "torque curve" on high gear, although a careful reading of the article will no doubt furnish this information to an attentive reader.

The tests proposed are based upon the suggestion of Mr. C. P. Grimes in the May, 1916, issue of the *S. A. E. Bulletin*, at page 286, in which the time necessary to increase the speed or decrease the speed of the car by 10 m.p.h. becomes the basis for a calculation of the resistance overcome by the car, or which the car could overcome at the mean speed, *i.e.*, a speed 5 miles greater per hour than the original speed, if the car is accelerated or 5 miles less than the original speed if

the car is slowed down. The assumption is that in each case there is either a steady decrease in speed or a steady increase in speed through the number of seconds which elapse, in which the car speed is reduced or increased by 10 m.p.h. The assumption is not quite exact. It is equivalent to assuming that the torque and rolling resistance curves between the speeds involved are straight lines. The error results in only a very slight diminution of the torque curve and a slight exaggeration of the rolling resistance curve.

Table 1 is based on the fact that a car running one mile per hour passes over a distance of 1.466% ft. per second. At 10 m.p.h. it passes over 14.66% ft. per second.

At whatever speed the car may be running, if it increases or decreases in speed by 10 m.p.h. in any given number of seconds, the number of seconds so required divided into 14.666% gives the rate of such change, in feet per second, per second.

Mr. Grimes used a stop watch, and this would seem to be desirable, particularly where the car speed is increased and the observation takes but a few seconds. Interesting results can be obtained, however, by merely estimating the seconds by count. This of course would require some practice. For taking account of the grades of the roads on which experiment is made, an inexpensive, home-made instrument is hereinafter suggested, which would require practice also in pacing distances. The method does not involve any calculations, as

TABLE I.

Secs.	Ft. per Sec.	Resistance	Grade
1	14.66	916.5 lbs.	45.8%
1½	9.78	611 lbs.	30.5%
2	7.33	458 lbs.	22.9%
2½	5.86	366.6 lbs.	18.3%
3	4.89	306 lbs.	15.3%
3½	4.19	268 lbs.	13.4%
4	3.67	229 lbs.	11.45%
4½	3.26	203.7 lbs.	10.2%
5	2.93	183.3 lbs.	9.1%
5½	2.66	166.3 lbs.	8.3%
6	2.44	152.7 lbs.	7.6%
6½	2.26	141.3 lbs.	7%
7	2.10	131 lbs.	6.5%
7½	1.96	122 lbs.	6.1%
8	1.83	114.5 lbs.	5.7%
8½	1.73	107.8 lbs.	5.4%
9	1.63	102 lbs.	5.1%
9½	1.54	96.2 lbs.	4.8%
10	1.46	91.5 lbs.	4.58%
10½	1.40	87.5 lbs.	4.38%
11	1.33	83.6 lbs.	4.18%
11½	1.275	79.7 lbs.	3.98%
12	1.22	76.3 lbs.	3.8%
12½	1.173	73.3 lbs.	3.66%
13	1.13	70.5 lbs.	3.52%
13½	1.090	67.9 lbs.	3.39%
14	1.05	65.5 lbs.	3.26%
14½	1.011	63.1 lbs.	3.15%
15	0.97	61.1 lbs.	3.05%
15½	0.946	59.1 lbs.	2.95%
16	.91	57.25 lbs.	2.86%
16½	.88	55.5 lbs.	2.78%
17	.86	54 lbs.	2.7%
17½	.84	52.5 lbs.	2.62%
18	.82	51 lbs.	2.54%
18½	.80	49.6 lbs.	2.46%
19	.77	48.2 lbs.	2.40%
19½	.75	46.83 lbs.	2.34%
20	.73	45.7 lbs.	2.30%
40	.36	22.8 lbs.	1.15%

The first column of this table indicates the number of seconds required to increase or reduce speed by ten m.p.h. Opposite this is the rate of acceleration or retardation in ft. per sec., per sec., next the corresponding resistance in pounds per ton of 2000 lb., and finally the corresponding grade per cent.

SUPPLEMENTAL TABLE

Giving seconds and intervals of one-fifth of a second between four seconds and twelve seconds.

Secs.	Ft. per Sec.	Resistance	Grade
4	3.67	229.4 lbs.	11.45%
4.2	3.49	218 lbs.	10.9%
4.4	3.33	208 lbs.	10.4%
4.6	3.15	197 lbs.	9.8%
4.8	3.05	190 lbs.	9.5%
5	2.93	183 lbs.	9.1%
5.2	2.83	177 lbs.	8.8%
5.4	2.72	170 lbs.	8.5%
5.6	2.62	164 lbs.	8.2%
5.8	2.53	158 lbs.	7.9%
6	2.44	153 lbs.	7.6%
6.2	2.36	148 lbs.	7.4%
6.4	2.29	143 lbs.	7.1%
6.6	2.22	139 lbs.	6.9%
6.8	2.15	135 lbs.	6.7%
7	2.095	131 lbs.	6.5%
7.2	2.03	127 lbs.	6.3%
7.4	1.98	124 lbs.	6.2%
7.6	1.93	121 lbs.	6.0%
7.8	1.88	118 lbs.	5.9%
8	1.83	115 lbs.	5.7%
8.2	1.79	112 lbs.	5.6%
8.4	1.75	109 lbs.	5.4%
8.6	1.71	106 lbs.	5.3%
8.8	1.67	104 lbs.	5.2%
9	1.63	101.5 lbs.	5.0%
9.2	1.59	99 lbs.	4.9%
9.4	1.56	97.5 lbs.	4.8%
9.6	1.53	95 lbs.	4.7%
9.8	1.50	93 lbs.	4.6%
10	1.4666	91.5 lbs.	4.55%
10.2	1.44	90 lbs.	4.5%
10.4	1.41	88 lbs.	4.4%
10.6	1.38	86.5 lbs.	4.3%
10.8	1.36	85 lbs.	4.2%
11	1.333	83 lbs.	4.15%
11.2	1.31	82 lbs.	4.1%
11.4	1.29	80.5 lbs.	4%
11.6	1.26	79.5 lbs.	4%
11.8	1.24	78 lbs.	3.9%
12	1.222	76 lbs.	3.8%

the tables published herewith supply the information directly.

The rolling resistance curve, so far as it is necessary to be understood for the present purpose, merely indicates the number of pounds resistance per ton weight of the car overcome by the forward motion of the car on a level, straight macadam road. The ton is taken at 2000 lb., and the weight of the car includes its full passenger capacity, together with water, gas, oil, tools, etc. If the car were pulled forward by a spring balance and its weight exactly one ton, including its passengers, the indicator of the balance would show this resistance overcome in pounds. This resistance increases rapidly with increasing speed. Plotting the resistance at the several speeds on a suitable diagram, showing miles per hour and pounds per ton weight of the car, results in the above mentioned rolling resistance curve, which is becoming common enough in automobile literature.

Of course it is desirable to have this curve as low as possible. The less the resistance the greater is the saving in gasoline, and the greater also is the ability of the car both in speed and in hill climbing. When this curve is known as to any particular car, an increase at once indicates some difficulty either with the engine or with other parts of the car.

The torque curve shows so much of the power in pounds per ton of the engine at each speed as is delivered to the rear wheels. Part of this power is absorbed in the rolling resistance. The remainder is available for the climbing of hills, driving through gravel or mud and for any other purposes where extra power is called for, without diminution of speed. If the rolling resistance curve of a particular car remains the same but the torque curve is lowered, it indicates probably some difficulty in the engine, usually the effects of carbon in the cylinders. As it requires exactly 20 lb. of energy per ton to overcome each 1 per cent of grade, a glance at the diagram for a car shows at once for any given speed, the difference between the total pounds of torque and those absorbed by rolling resistance, and this divided by twenty gives the exact grade the car can ascend at that speed.

From what has been said, it is evident that there are two questions which may be asked respecting the motion and power of a car at any speed on a level, good road. The first is, how much resistance it is overcoming, and the second, how much more resistance can it overcome if necessary? The answer to the first question is the rolling resistance at the given speed, and that answer, together with the additional resistance, found in answer to the second question, indicate the torque power at the given speed.

**Start Test at 10 m.p.h.**

Assuming a level, good road, and a suitably loaded car, i.e., a car with its full complement of passengers, etc., the first of these two questions is answered by bringing the car up to a given speed, say 10 m.p.h., declutching and noting the number of seconds required to coast to a standstill. The mean speed will have been, of course, 5 m.p.h. Referring to Table I and assuming that it has required 20 sec., we find that the mean resistance, i.e., the resistance at 5 m.p.h. is approximately 46 lb. If the car is then brought up to a speed of 15 m.p.h. and by declutching is allowed to drop to 5 miles, the average speed is 10 miles. If that has taken 18 sec., the table indicates a resistance of 51 lb. Thus, by starting each initial speed 5 miles greater for each successive test, we secure the resistance for a succession of mean speeds, each 5 miles less than the initial speed, having in each case noted the number of seconds which are required to reduce the speed by 10 m.p.h. If desired, the results may be plotted on a diagram and the resistance curve drawn. For practical use, however, a memorandum of the seconds required at the several speeds would be all that would be needed for reference. Even the table would not have to be consulted in a later test of the condition of the car. All that would be needed would be a memorandum of the seconds noted in the first test.

Somewhat similarly, the second part of the test consists in accelerating the car speed, first from 5 to 15 m.p.h., noting the number of seconds required and finding from the table the number of pounds of "resistance per ton overcome," as being the surplus energy at the mean speed of 10 m.p.h. Assuming for the sake of illustration that this was 5 sec., reference to the table would show that the surplus energy of the car at the speed of 10 m.p.h. was 183 lb. per ton weight of the car, and referring again to the result obtained by the previous test at a mean speed of 10 m.p.h., which we may assume to have been 18 sec., and the corresponding number of pounds 51, the total energy of the car would consist of 183 + 51, i.e., 234 lb. available at the rear wheels. Similarly, successive tests begun at 10, 15, 20, 25 and 30 m.p.h., accelerating to an additional 10 m.p.h. in each case, will give the surplus power of the engine at each mean speed, five miles greater than the initial speed. For each speed, adding the resistance found in the table and the resistance already found to be overcome in the first series of tests, will give the total power of the engine for each speed and permit the plotting of the torque curve.

**Two Illustrations**

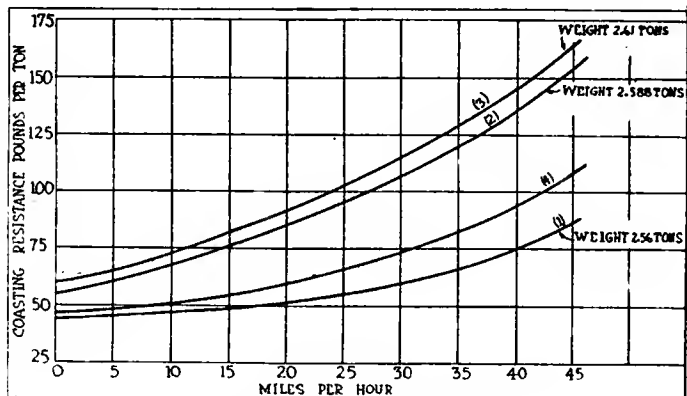
As in the case of the first series of tests, for subsequent tests of the car, only the number of seconds elapsing at each speed will be needed to show the condition of the car and engine. As an illustration, the two tests might result as follows:

ROLLING RESISTANCE			
Seconds	M.P.H.	Mean Speed	Resistance Lbs.
15	10 to 0	5	61
13	15 to 5	10	70
11½	20 to 10	15	80
11	25 to 15	20	84
10	30 to 20	25	92
8	35 to 25	30	115
7¼	40 to 30	35	125

ADDITIONAL ABILITY			
Seconds	M.P.H.	Mean Speed	Additional Ability, Lbs.
6	5 to 15	10	153
5¾	10 to 20	15	160
6	15 to 25	20	153
6½	20 to 30	25	142
7½	25 to 35	30	122
9	30 to 40	35	102

TOTAL ABILITY FOR TORQUE CURVE			
M.P.H.	Rolling Resistance, Lbs.	Additional Ability, Lbs.	Total Lbs.
10	70	153	223
15	80	160	240
20	84	153	237
25	92	142	234
30	115	122	237
35	125	102	227

Referring to the diagram herewith, reprinted from an article by Prof. W. G. Marshall in THE AUTOMOBILE of 24th April, 1913, page 889, Fig. 3, the test here proposed for finding rolling resistance would show the seconds and corresponding resistance about as follows, for the theoretical curve, which on the diagram is numbered (4).



Professor Marshall's original curve

Seconds	Reduction in Speed M.P.H.	Mean Speed M.P.H.	Resistance Lbs.
19	10 to 0	5	48
18	15 to 5	10	51
16½	20 to 10	15	56
15	25 to 15	20	61
13½	30 to 20	25	66
12½	35 to 25	30	74
10½	40 to 30	35	87

On the same diagram are the rolling resistance curves of three cars, one of which is below even the theoretical curve, which, by the way, is empirical and therefore one which will admit of such a possibility. For this last mentioned curve, No. 1, the sequence of observed seconds, as derived from the table, by looking first for the number of pounds of resistance at each speed, would be 20, 19½, 18½, 17½, 16½, 14½ and 13½. The other two car curves show unusual resistance, and in the case of one of them it was stated that the brake band was found to be dragging. The observed sequence of seconds for these curves would be for No. 2, 15, 13½, 12, 11, 9½, 8½, 7½, and for No. 3, 13½, 12½, 11, 10, 9, 8, 7.

Having once tested a car through a series of speeds, both accelerating and retarding, one would have at hand the number of seconds found at the several speeds, both for accelerating and retarding the car and could then, at any time, when there happened to be a full complement of passengers, accelerate or declutch and in a few moments be able to compare the present car condition with its former performances.

It should be borne in mind that while these tests reveal present engine ability and condition of the car, they do not give any clue to workmanship nor the quality of material used in the car. Time alone will show this. It should also be remembered that while a new car might be subjected to the rolling resistance test through moderate speeds, it ought not to be subjected to the acceleration test until it has run for a thousand miles or more. After that it should show increasing power with additional use of the engine.

#### Can Test on Grade

It has been assumed that a level road is to be utilized for these tests, but it is, as to some of the tests at least, possible to utilize a road with a slight grade of 2 or 3 per cent. In such case the tests must be repeated in opposite directions in each case and the results to be taken are the mean values of the pounds of resistance and not the mean of the number of elapsed seconds. If an attempt is made to utilize the mean of the seconds an error is introduced. As to the matter of speed watches, it may be said that they can be purchased for a minimum of \$4. But a more satisfactory watch of Swiss make, including the regular hour and minute hands, can be had for \$18.75. The seconds are divided into fifths and the subdivisions are outside the line of the even seconds and therefore much more easily read. It may be permitted to mention that F. William Barthman, corner of Broadway and Maiden Lane, New York, is one from whom such a watch could be purchased.

It is worth while to practise with the aid of such a watch the counting of seconds, accompanied by some motion or pressure of the finger or foot. With practice, seconds may be counted with considerable accuracy, so that up to perhaps 15 sec. it might be even possible to note a fraction of half a second by such an estimate, the watch in that case being an excellent check on the accuracy of the count. Another way of counting when the number of seconds to elapse is less than 10, is by counting as rapidly as possible, each unit of the count being a fifth of a second. This also is a matter which requires practice. Astronomers, aided by the ticking of a seconds pendulum, ordinarily expect to estimate to one-tenth of a second, but of course they start from the last even second as given by the tick of the clock.

#### Needle Speedometer Best

In utilizing the method above indicated, a speedometer with an indicator needle is superior to those which merely

display a number, as a mere glance is sufficient to read them. In fact, the indicator needle is for all purposes safer, for the eye can take note of the angle of the needle quicker than it can read figures displayed in an opening. The lag of the instrument and its error, particularly at low speed, will have to be estimated as well as possible. This can be determined by taking time over a measured course.

Several repetitions of the same test will give a clue to the probable accuracy of the observer. If his results vary widely the value of his readings will be greatly diminished. If they are nearly alike they will have a higher value, but there will still remain the question of the personal equation, which will have to be looked into as well as possible. One driver will always be a little short in his estimate and another a little over. But as to this it may be said that the error being peculiar to the person, it is likely to be repeated in successive experiments, so will not really interfere with the comparisons which the same driver may wish to make with later figures of his own obtaining. Of course, the personal equation would enter also into the starting and stopping of the watch as well as in the estimating of the time.

#### Grade Sometimes Advantage

If the per cent grade is known, there is sometimes an advantage in utilizing it in preference to a horizontal road. On a 3 per cent grade, making the tests down the grade, 60 lb., due to the grade, is deducted from the actual rolling resistance and instead of, for example, 5½ sec. showing a true resistance of 166.3 lb., the time on the grade will approximate 8½ sec., indicating about 107.8 lb., to which is afterward added the 60 lb. of grade resistance, to obtain the result with an accuracy within 2 lb. The chief advantage of this is that it spreads out the time of the observation and that an error of ½ sec. at 8½ sec. is only 5 lb., whereas at 5½ sec. it amounts to 20 lb.

There are, of course, very definite limits, outside of which use cannot be made of even a 3 per cent grade. For example, if the rolling resistance at 15 m.p.h. is in fact 50 lb., a car declutched on a 3 per cent grade would run on indefinitely, the acceleration due to grade being in excess of the rolling resistance of the car.

The grade per cent can sometimes be found by running the car up the grade and afterward down the grade. If the coasting resistance at a given mean speed up the grade is found to be, for example, 150 lb., and down the grade 70 lb., the mean of these, or the true rolling resistance is 110 lb., and the difference between this and each of the readings obtained is 40 lb., which divided by 20 (20 lb. to each 1 per cent of grade) gives 2 per cent as the actual grade.

The grade per cent being known, if the run is made up the grade and the 10 m.p.h. drop in speed on declutching takes 9 sec., corresponding to 102 lb. resistance, 60 lb. is to be deducted for grade, assuming it to be 3 per cent. The rolling resistance is therefore only 42 lb. for the mean speed of the test. If on the other hand the same test is run down the grade and results in 9 sec., the corresponding resistance is 102 lb., to which the grade resistance of 60 lb. is to be added and the actual rolling resistance is 162 lb. Briefly it may be said that the length of level road necessary for these tests, exclusive of the distance required to get up speed, is approximately only 100 yd., whether the tests are at high speeds or at low speeds.

For rolling resistances between the mean speeds of 10 and 35 m.p.h., the resistance should vary between 50 and 125 lb., according to the speed, and the number of seconds required should be between 7 and 20, neither more nor less except on grade. For acceleration, the equivalent pounds of resistance overcome should vary between 75 and 200 lb., and the seconds required by the test would be between 4½ and 13. It will be obviously advantageous to run these latter tests up a definitely known grade of 2 or 3 per cent, thus increasing

the number of seconds elapsing. If time is estimated without a watch, the results will probably be most correct where the time varies between 8 and 15 sec., but if made with a stop watch, the more accurate results will be where the time varies between 10 and 20 sec. A 3 per cent up grade will reduce a 20-sec. test to about 9 sec., while a 3 per cent down grade will bring a 6-sec. test up to 13 sec.

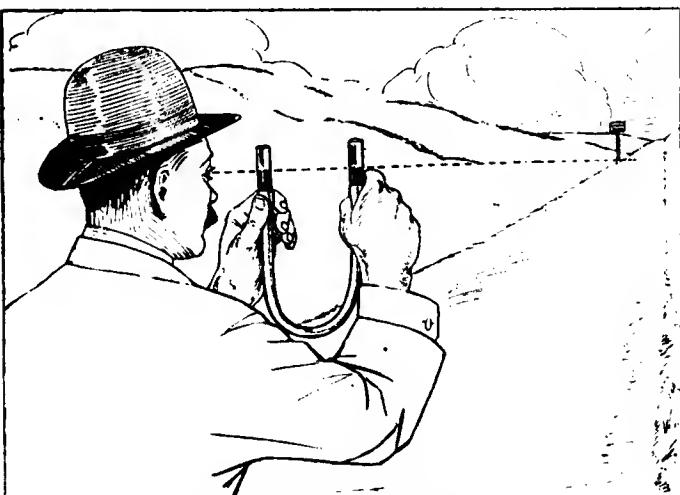
The maximum speed which a car can maintain ascending a steep grade of which the per cent is known, gives an accurate gage of the accelerative power, and on the other hand, the maximum coasting speed on a long, slight grade gives an equally accurate gage of the rolling resistance at that speed. The method above indicated for ascertaining the grade per cent is, of course, applicable only to very slight grades. For steeper grades other means have to be employed.

Formerly there were for sale several kinds of grade measures intended to be attached to the car. They seem not to have been very popular and the only one now occasionally to be found is a glass tube, metal inclosed, containing a shot moved slowly in a liquid against a paper scale. The accelerometer will also indicate grade, if properly leveled, the car either being stopped or proceeding at an even rate of speed. Makers of surveying instruments also carry in stock several kinds of clinometers for measuring the slope of masonry, etc. These could be temporarily applied to any horizontal part of a car standing on a slope. These instruments, however, have too great a range of grades and the part of the scale useful for automobiles is too minute for practical use, even with the verniers which are a part of some of them. The wheelbase of the car is also not sufficiently long to indicate very accurately the slope of the hill.

Fortunately there is a ready way of obtaining the grade per cent with sufficient accuracy and with little trouble or expense. The height of the observer's eye, as he stands erect, given in feet and decimal fractions of a foot, furnishes the perpendicular. The number of paces up the hill required to reach the point where the level of the eye intersects the roadway supplies the only other information necessary. Surveyors adopt as standard a pace of 2½ ft. This is distinctly shorter than the usual step, and thus requires some practice and attention. A New York City avenue block is 260 ft., including the cross street, i.e., from the north curb of one street to the north curb of the next, and should be covered in exactly 104 paces. Wherever the pacing is practised the distance should be measured and the practice continued until the exact number of steps can be regularly taken.

**How to Gage Grade**

The mental estimate of the point where the eye level intersects the roadway will be found to be too far up the hill. A hand level can be improvised as described below, or can



Apparatus for grade determination

be purchased. On the market there is a 5-in. level consisting of a sighting tube and the level bubble which is reflected down into the line of sight by a prism. This is manufactured by Keuffel & Esser, a New York corporation making surveying instruments and having branches in other cities, the price being \$4.50. W. & L. E. Gurley of Troy, N. Y., make a similar but slightly larger level at \$8.

The home-made level consists of a foot length of rubber tubing with a short length of glass tubing inserted at each end of the rubber tubing, the whole being filled with water. For sighting the two glass ends are held perpendicular, the water level in each being, of course, the same, and the two ends being held 6 or 7 in. apart and in line with the eye and the road. As the water level always remains the same the whole instrument will have to be elevated or lowered in order to get the water surfaces in line with the eye. The point where the water surfaces intersect the road is then to be noted and the distance paced.

**Sighting Requires Practice**

For one accustomed to rifle shooting, the sighting is at first a little difficult, as the attempt to compel one water level to come into line with the other will, of course, end in failure, the fact that they are not in line with each other merely indicating that the whole instrument is either too high or too low. This instrument is accurate well within the needs of the observer. Any drug store can furnish the materials. An ordinary 10-in. glass feeding tube can be had for 5 cents. This is nicked in the middle with a file and broken into two lengths. By heating the ends to a redness a smooth edge is produced. A rather more satisfactory instrument can be made with a larger size of tubing at 20 cents a foot. The glass ends consist of a pair of tube connectors of large diameter, which are worth about 5 cents each. It is worth while to heat to redness one end of each of these connectors and expand it a little with any convenient metal tool so that a small cork can be used to hold the water when the instrument is not in use. So corked, the tubing with its supply of water can be carried in the pocket for days at a time without any risk of leakage.

The grade per cent is the ratio of the perpendicular to the slope and is not the same as the grade measure used by surveyors which is a certain number of feet in 100, which deals with the ratio of the perpendicular to the horizontal.

Table No. 2 has been calculated on a basis of a height of eye of 5 ft. 4 in., which equals 5.33 ft. The length of pace taken is 2.5 ft., and shows for each grade per cent the distance in paces to the point on the grade where the eye level intersects the road. It is correct for one whose height is 5 ft. 8½ in. It is also approximately correct for an eye level 1 in. greater or 1 in. less. On a 1 per cent grade the higher eye level would be 216 paces and the lower eye level 210 paces, a difference too slight to be of any importance. Similarly, on a 10 per cent grade, the number of paces would be 21.6, 21.5 and 21.2 respectively. This difference also would be immaterial.

TABLE II.

Grade.	Paces.	Grade.	Paces.
1%	213	14%	15
2%	106.5	15%	14
3%	71	16%	13
4%	53	17%	12.5
5%	42.5	18%	12
6%	35.5	19%	11
7%	30.5	20%	10.5
8%	26.5	21%	10
9%	24	22%	9.5
10%	21.5	23%	9
11%	19	24%	8
12%	18	30%	7
13%	16.5	35%	6

With respect to this table it should be noted that up to about 5 per cent grade a considerable error in pacing would hardly be appreciable, but on the other hand, the reading of the level would be uncertain by several paces, while for 10 per cent and above the level reading would be quite exact

(Continued on page 258)



# The FORUM



## A Test of Vacuum Brakes

WITH reference to the criticism by H. M. Brayton on the vacuum brake, the editorial note which you published in connection with this letter completely covers the criticism. As a matter of interest, the accompanying table represents the results of a test made on the Indianapolis speedway in a 1917 twelve-cylinder Packard which had been run 2000 miles. It will be noticed that the vacuum rises as high as 25 in. when the car is traveling faster and the foot is taken off the accelerator pedal. From 10 to 14 in. in the manifold will give sufficient atmospheric pressure to do the necessary braking on the largest car on account of the leverage links employed in connection with the brake cylinder.—Prest-O-Lite Co., Inc., Indianapolis.

M.P.H	Vacuum running	Releasing accelerator
10	14"	18"
15	15"	19"
20	15"	22"
25	15"	22"
30	15"	23"
35	15"	25"
40	10"	25"

## Suggests Steam Cooling

By W. W. Wells

THERMOSTATIC control of engine temperatures is a decided improvement over no control, but the principal reason for keeping the temperature as low as 180 deg. Fahr., seems to be the fact that our cooling medium begins to evaporate when much higher temperatures are reached. The water-jacket of an internal combustion engine is a necessary evil, carrying off heat that we would prefer to convert into mechanical energy. We put up with it simply to preserve the machine. If water at atmospheric pressure boiled at a temperature of 300 deg. Fahr. instead of 212 deg., we would probably be using considerably higher temperature than we do now.

### Steam Cooling for Economy

The makers of air-cooled engines claim great economy due to the fact that their engines operate at a higher temperature, and I have been told that it is possible to obtain great fuel economy by using live steam in the jackets when testing an engine. Others tell us that raising the temperature of the jacket water does decrease the amount of heat lost to the jacket, but the increase of the amount of heat lost in the exhaust leaves but little net gain.

Charles E. Duryea points out, in THE AUTOMOBILE for Oct. 26 the desirability of maintaining high engine temperature in order to prevent condensation of our present heavy fuels, and recommends an air-cooled two-cycle engine as a solution of the problem. The constant compression of the two cycle should be a decided advantage, and air cooling would give high temperature, but not a uniform temperature. The variations of temperature are probably more rapid than in a water-cooled engine, and the range of temperature greater.

I shall not attempt to guess what the best temperature is, but if we could maintain as close regulation as 225 deg. Fahr. as is now obtained by the use of the thermostat, there ought not to be any serious difficulty in the matter of lubrication; and, if the fuel and the air entering the carbureter were also maintained at a fairly high and constant temperature, the problem of carburetion would be very much simplified.

It might be feasible to use a shutter, controlled by a thermostat, to limit the circulation of air around the cylinders of an air-cooled engine, but there is another way of obtaining almost any desired temperature, between 212 and 300 deg., and maintaining it within close limits regardless of variations in atmospheric conditions, load or speed.

### An Intermediate Tank

A radiator might be built with an intermediate tank placed a little higher than the cylinder heads, and with the portion above this tank arranged to act as a condenser while the lower part acts as a water cooler. The intermediate tank could be divided into two or more sections and the outlet from the engine jacket connected to one of these sections. Then, with the radiator filled only to the height of this tank, the water circulates through only a portion of the cooler section, as long as no steam is formed. That is equivalent to using a very small radiator until the engine gets warmed up.

When the water begins to boil, steam enters the intermediate tank and passes up into the condenser. This condenser is arranged so that the steam passes through a considerable length of cooling surface, where it is condensed, and then into the other section of the tank, and this water of condensation is cooled while passing to the lower tank. The radiator could be made large enough to prevent loss of water in the hottest weather, and yet have all the advantages (and more) of the small radiator as pointed out by Mr. Duryea. *The effective radiating surface increases or decreases exactly as needed to meet varying conditions.* The jacket temperature is always 212 deg. Fahr., after the engine is once warmed up. This is about 30 deg. warmer than is customary with thermostatic control.

But if higher temperatures are desired, place a safety valve in the radiator vent, set for 5 lb. per sq. in. and the temperature goes up to 227 deg.; but it stays there only as long as steam is being generated as fast as it is being condensed. A decrease in the load on the engine, or an increase in the effectiveness of the condensing surface, such as might result from a change in the direction of travel in relation to the wind, would cause a drop of pressure and temperature.

To maintain a constant temperature of 227 deg., we would have to have a supply of air at 5 lb. pressure, to fill that portion of the condenser not filled with steam.

It is not necessary, however, to maintain pressure in the radiator, since it is only in the jackets that we need this higher temperature. The centrifugal pump used for circulating the water could be replaced by a positive pump that would produce almost any pressure desired; and with a pressure regulating device in the outlet from the engine, we could maintain any desired pressure in the water jacket and yet have the radiator operating under atmospheric pressure. The pump should have capacity enough to supply more water than could be evaporated at full load, but less than would cool the engine without boiling at light loads. With this arrangement, the radiator could be all condenser instead of part condenser and part cooler.

It does not appear difficult to maintain quite high pressures in this way. A pressure of 52 lb. would mean a temperature of 300 deg. Fahr., or 149 Cent. in the jacket, with correspondingly higher temperatures for the cylinder walls. The steam in passing from the engine to the radiator is capable of doing quite a little work, and might be used to drive the fan, automatically increasing the speed of the fan as needed.

With steam-jacketed carbureter and intake manifold and a steam heater for the air entering the carbureter we would have a uniformity of conditions for the gas making apparatus that is impossible when depending on exhaust heat. The carbureter could be accurately adjusted to these conditions, and with the higher temperatures, as mentioned above, it might be possible to burn kerosene without the use of the exhaust heat.

#### Investigate Higher Temperature Possibilities

Some object to higher temperature on the ground that an engine will not run as smoothly at 200 deg. as it will at 175 deg., but is this an inherent disadvantage or is it due to the fact that our engine designs are based on experience with water cooled engines? Would it not be possible to design an engine that would run as smoothly when the jacket water is boiling as when it is warm? Since hopper cooled stationary engines and air-cooled engines operate successfully, it would seem worth while to investigate the possibilities of higher temperatures. The subject may not interest builders of high priced passenger cars but it ought to be of interest to truck manufacturers. Perhaps the builders of stationary engines can tell us something of the relative advantage of a 212 deg. jacket and a cooler one.

### Faults in Carbureters

By P. S. Tice

IN THE AUTOMOBILE for Dec. 14, under the heading Lower Fuel Is Greatest Carbureter Problem, J. E. Schipper discusses the requirement of acceleration in a car from the carbureter viewpoint, and leaves the reader with the impression that a reasonable or high rate of car acceleration is only obtained with mixtures that are richer in fuel than that required or used in normal steady running. That this is not and cannot be the case is almost self-evident. However, no reflection is made or is intended upon Mr. Schipper's handling of the case, since it is a fact that those well known carbureters which perform best under acceleration of the engine do, almost without exception, alter the ratio of fuel to air supplied when this demand is made upon them.

But what is really accomplished by this apparent enrichment of the mixture is not an enrichment at all, but is simply the momentary supplying of excess fuel, so that the normal quality of the charge *may not be impaired*. As we are all very much aware, the average fuel supply system is not particularly strong as a fuel vaporizer. Any sudden demand for more mixture imposes a reduction in the relative rate of vaporization going forward at the instant preceding the demand. Thus, when the throttle is opened to accelerate the car, the heat content and capacity of the system is insufficient to handle the increased amount of fuel. This results in an impoverishment of the mixture, considering only its active portion consisting of vapor and air. The expedient, naturally, is to supply more fuel under this condition, so that the mixture may be kept normal, or more nearly so, in the matter of its vapor content. Obviously, this is at the expense of fuel, since only the more volatile portions can be used under the then condition of low vaporizing capacity in the system as a whole.

It is a conclusion based on experimental evidence and observation of the field that all acceleration wells and their equivalents are expedients adopted by the makers of carbureters embodying them to correct in some measure for the weakness of present-day carbureting methods. No one will argue that the modern carbureter is not a marvel of perfection in the way it handles the problem of proportioning of the mixture. Its perfections are the more apparent when one considers the almost absolute lack of support offered the carbureter by the other components of the systems in use.

It is the experience of the writer, and, it is believed, of

some other workers in the field, that the simplest of all carbureter designs will give perfect results on all points, and particularly in the matter of acceleration of the car, if provisions are made for the complete evaporation of the fuel somewhere in its travel between carbureter nozzle and the combustion chambers. With a full realization of fuel evaporation, it is unnecessary and wholly undesirable that the mixture proportions be disturbed by the action of a well or similar auxiliary at the time of acceleration. This is but one of the counts on which such a system scores over the conventional lay-out in the matter of economy and general desirability of performance.

### Favors Lower Tire Pressures

By R. H. Upson

Goodyear Tire and Rubber Co.

IN FORUM of THE AUTOMOBILE for Dec. 21, O. B. Parkinson, brought out the point that if the printed advice of the tire manufacturers as to the degree of inflation was rigidly adhered to, many tires would be pumped too hard. Some of the points brought out in Mr. Parkinson's recommendations, are at least questionable, but in the main proposition I wish to say his views are entirely in accord with at least one of the foremost tire manufacturers.

The main trouble with the old inflation schedule was the fact that it was good for only one set of conditions and those conditions included the assumption of maximum load on the tire and practically no comfort for the passengers. P. W. Litchfield discussed this subject in detail at the summer meeting of the Society of Automobile Engineers in June, 1915, this article being reprinted in whole or in part, in most of the current issues of automobile magazines. In it he brings out the development of a loading and inflation schedule which will be practical and at the same time sufficiently flexible to meet the various conditions and requirements of the user.

#### Suggests Inflation Scale

The table referred to is the result of painstaking investigations with tires, both in the laboratory and on the road, and the figures were chosen with due regard to ease of riding as well as other items. The illustration shows celluloid scales by which can be figured graphically the proper inflation of any tire. The "inflation and load scale" gives the best average pressure for various degrees of loading on tires of different sizes. The "calculator" goes deeper into the problem. By its use one can figure for any given car and external conditions, just what advantages may be obtained by varying the inflation pressure or the size of the tires, on the same car. The use of this latter device pre-supposes some definite recorded experience with tires on the road. The successful use of a reasonable inflation scale depends upon the ability of the American motoring public to appreciate its limitations and not abuse it. I believe that the time has come when such a scale can and should be universally adopted.

### Inertia and Stroke Ratio

By Edward G. Ingram

I HAVE read the interesting paper by A. F. Milbrath published in THE AUTOMOBILE for Jan. 11, but beg to differ from his views in one point. In speaking of reducing reciprocating weight he says: "A small diameter of cylinder with a long stroke is favorable since the weight of a piston increases with some power of the diameter between the second and third, and the inertia forces of the piston vary likewise as long as the piston speed is constant."

This is an entirely unsatisfactory way of comparing the inertia forces of long and short stroke engines because these forces should be compared at equal power output, and this will not be developed at equal piston speeds but at equal

r.p.m. That is, each cylinder of say a 300 cu. in. engine will be taking in and discharging the same amount of gas per minute at equal r.p.m. no matter what the stroke bore ratio, but *not at equal piston speeds.*

Now if the bore of a long-stroke engine is increased and the stroke decreased, the displacement remaining the same, the pistons will of course be heavier, but the *piston speed will be lower.* It is the case of a greater weight moving at

a lower speed and one will tend to offset the effect of the other.

It can be proved mathematically that the inertia forces of engines of the same displacement will be the same if the piston weight is inversely proportional to the stroke, and I believe in practice that this will tend to be true. I agree entirely with Mr. Milbrath's statement that the long-stroke engine will be heavier than the short-stroke of equal volume.

## Simple Methods for Testing Car Ability

(Continued from page 255)

within less than one pace, but an error in pacing, even a single pace, would make a material difference. Of course one can construct his own table by taking any height of eye, as, for example, 5.1 ft. A slope of 510 ft. would be a 1 per cent grade; dividing by 2½ to reduce it to paces equals 204. This again may be divided by 3, 4, 5, etc., the different per cent grades, resulting in the number of paces for each corresponding grade.

The resistance in pounds per ton and the grade per cent bear fixed relations to the change of speed in feet per second, which may be stated as follows:

A = acceleration of retardation in ft. per sec., per sec.

R = resistance in lb. per ton of 2000 lb.

G = grade per cent, considered not as a decimal but as a whole number.

Then;

A = 0.32 ft. (or nearly 4 in.) for each 1 per cent of grade.

R = 20 lb. for each 1 per cent of grade.

If G is given, multiplying it by 0.32 gives the corresponding A, and multiplying it by 20 gives the corresponding R.

If A is given, it may be divided by 0.32 to obtain G or multiplied by the constant 62.5 to obtain R.

If R is given, it may be divided by 20 to obtain G and by 62.5 to obtain A.

If it is desired to translate the results of the above-mentioned experiments into horsepower, the formula is as follows:

$$H.P. = \frac{T \times \text{m.p.h.} \times R}{375}$$

In this equation T equals the weight of the car with its full complement of passengers, gas, etc., in tons of 2000 lb., m.p.h. equals the speed in miles per hour. R equals the number of pounds of resistance per ton. The 375 is a constant derived from cancelling out 88 ft. per min. at 1 m.p.h. in the numerator as against 88 × 375 (equals 33,000) in the denominator.

## Establishments of Chile's Largest Accessory Dealer



The accompanying illustrations represent the three garages, supply and accessory stations of Ahumada & Co., Santiago, the largest dealer in accessories in Chile. These stations supply 75 per cent. of the gasoline used in Santiago. There are 2000 cars in this city, 70 per cent. of which are U. S. A. automobiles of various makes

# Conferring Individuality on an Old Car

By Redesigning Body, Fenders, Hood, Radiator, Windshield and Top Old Models May Be Successfully Rejuvenated

By D. R. Martin

**D**ISTINCTIVELY individual automobile designs are in greater demand every day. Not so very long ago a man was entirely satisfied with a car, the exact duplicate of which could be seen on every side of him. But of late, there is a stronger desire for something entirely different, a longing for a car that is different from any car in the world. This desire may be satisfied, in the case of some owners, by an individual color scheme on some standard make of car; but for others, the necessary differentiation can only be obtained a so-called special or custom body. The farther a custom design differs from the standard, the more comment and attention it will draw. Generally a custom body will require specially designed fenders, hood, radiator, windshield and top to insure a pleasing and harmonious scheme from the ground up and from the front to the rear bumper. But there are always certain limitations imposed by the chassis which will govern the design in general. However, the present day chassis will admit of innumerable custom designs and with a little forethought in the selection of the chassis one may satisfy practically any individual taste. The necessary expenditure for a custom design is relatively like anything else—the more and better one desires, the greater will be the cost.

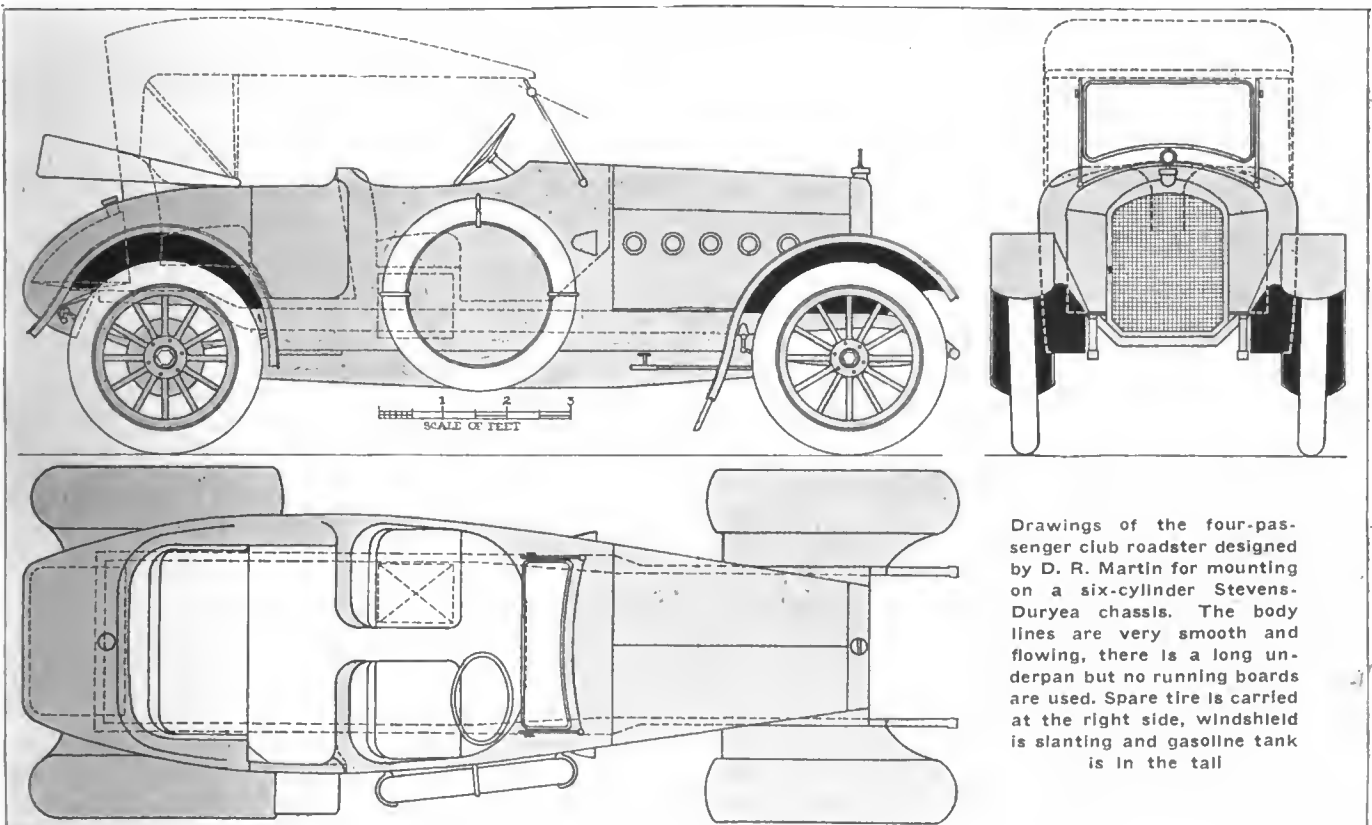
### Three Distinct Advantages

First—One may have just what he desires; a high or low, long or short, narrow or wide body; one, two, three, or four

doors; seating for any number of passengers with standard or low seats; in fact, everything as he desires and to meet his individual requirements, and, incidentally, his pocketbook.

Second—One may well take pride in such a creation, and why should he not? Everything is just as he wanted it. There never was a custom design that did not create interest and comment wherever it was driven and all this comment is bound to be favorable providing the design is entirely “possible” and not an “unusable freak.” Such general interest in one’s car is a great incentive to keep it always looking and running at its best so that the result of close examination by the ever-present curious will be nothing but pride in ownership.

Third—The writer wishes here to express a very great advantage which has never been mentioned in connection with custom designs. The custom designed car is much less liable to be stolen because the possible thief realizes the comparative ease with which such distinctive designs may be apprehended. The authorities as well as the motoring public soon learn to associate the rightful owner of such a car with the car itself. And as for petty thefts, such as tires and accessories, such a car is never without some attention from the curious, even though standing in a comparatively secluded parking space and this very fact tends to discourage such thefts. What should also be considered as an advantage is the fact that the driver of such a car must observe the rules of the highway and all traffic laws to a greater extent than



Drawings of the four-passenger club roadster designed by D. R. Martin for mounting on a six-cylinder Stevens-Duryea chassis. The body lines are very smooth and flowing, there is a long underpan but no running boards are used. Spare tire is carried at the right side, windshield is slanting and gasoline tank is in the tail

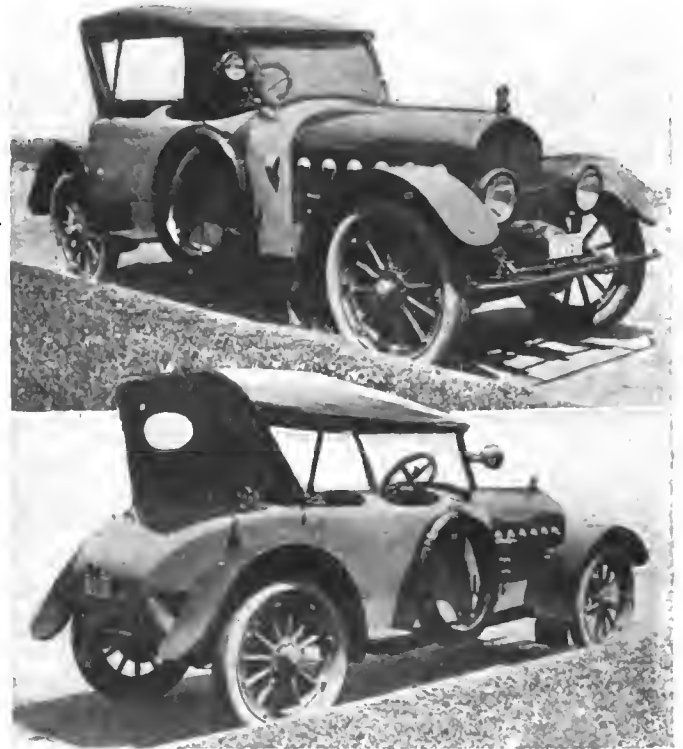


the driver of a standard car, because there are more eyes on him.

#### A Custom Design

The writer herewith presents a design of a four-passenger club roadster which has proven so entirely satisfactory after 4 months' driving that nothing in the design would be altered if he were to build it again, and certainly the proof of a car is the driving of it. The chassis used is a Stevens-Duryea six-cylinder of 130-in. wheelbase, with right-hand drive and control. The hood and body lines flow back from the radiator without any reverse curves or swells, giving the much desired fast and racy lines. The body has but one door and the front seats are divided with a 7-in. aisle between them. There are no running boards of any kind, a small step under the door giving access to the car, and the body sides are carried well down below the frame line. The rear of the body is a full turtle-back with a complete under-sweep, the rear seat setting into the body lines and not running into them. The front seat backs form a double cowl and the body sides have a slight kick-in for the lower third and a tumble-home for the upper eighth. The instrument board sets flush with the back of the cowl and is metal covered and painted the same color as the body. The radiator is of special design, being high and narrow with well rounded corners. The fenders are also of special design with long leather splashers on the front. The windshield is set at a rake and secured to the cowl by means of a special aluminum casting. The spare tire is carried on the right side of the body where same can be removed without danger from passing cars and the horn is carried on the left side of the body—and not under the hood—where it can be used to the best advantage. Six port-hole vents in each side of the hood allow for discharge of the air from the fan and an eye-brow vent on each side of the body with movable louvres inside give the required ventilation to the cowl compartment. A graduated curved pan incloses the underside of the chassis from front to rear and from body side to body side, giving a very neat and finished appearance underneath. The entire body, including the body filler sides under the hood and the port-hole vents, is painted a deep cream; the wheels, fenders, radiator, hood, horn and windshield are a light olive green; the running gear a Brewster green; and the top and upholstery black.

For the benefit of the skeptical the writer wishes to remark upon the apparent innovations as follows—the absence of the running boards is not a disadvantage from the standpoint of keeping the body clean as during 4 months' driving there has not been a spot of mud thrown on the body by the car itself—of course mud from passing cars cannot be



Two views of the Stevens-Duryea six fitted with distinctive four-passenger club roadster body designed by D. R. Martin

avoided; and the undersweep of the turtle-back at the rear of the body and the complete underneath pan are a decided advantage as far as protecting the occupants of the rear seat from road dust is concerned, which is proven by the fact that even with the rear top curtain rolled up there is much less dust in the rear seat than with the old type of body design and the rear curtain fastened down. In addition to this the writer wishes to say that the long cowl with the windshield set well ahead gives excellent protection to the occupants of the front seats in inclement weather and in warm weather the eye-brow vents supply plenty of ventilation. The color scheme has proven a decided advantage over the darker colors because of the fact that a heavy coat of dust is scarcely perceptible even when observed from close up to the car.

In conclusion the writer must say that he is more than pleased with the design and very evidently is not the only one judging from the many favorable comments passed.

## Smith Flyer Buckboard Driven by Motor Wheel

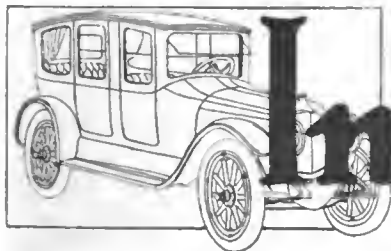


Smith Flyer two-passenger four-wheel buckboard driven by Smith motor wheel

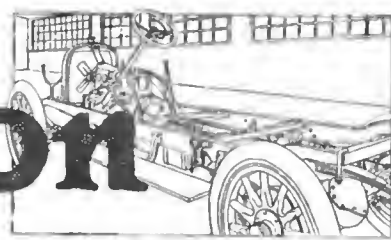
*THE Smith Flyer, manufactured by the A. O. Smith Co., Milwaukee, Wis., is a light and sturdy motor vehicle made from a four-wheeled buckboard with a Smith motor wheel attached to the rear. This machine, though its entire weight is but 135 lb., is capable of running at 20 to 25 m.p.h. and one can go from 80 to 90 miles on 1 gal. of gasoline.*

*The control consists of a small thumb lever attached to the steering wheel and clutch and foot brakes are the same as those on a regular automobile. The wire wheels are fitted with double tube clincher tires and are 20 in. in diameter. The wheelbase is 70 in. and the tread is 30. The motor wheel is lifted about an inch off the ground by means of the clutch and is cranked by a handle on the drive wheel. By letting out the clutch the wheel is dropped to the ground. Price, \$125, f.o.b. Milwaukee.*

*The body is fully equipped with tan upholstered seats, is made of natural wood with mudguards, and metal parts are nickel plated. In winter the wheels can be removed and sled runners attached, making it a motor sled.*



# Information



In a recent issue of THE AUTOMOBILE the Ros-trum, as a department devoted to answering the questions of readers and to publishing communications of general interest, gave way to Information. In the new form a higher efficiency is aimed at by economy of space and a method of direct reply.

**Q** UERY—In converting a Ford into a speedster, advis-ability of using racing camshaft and where obtain-able. 2—Timing with new shaft. 3—Need for larger manifold if valve enlarged. 4—Value of aluminum pistons and controlling connecting-rods. 5—Possibility of removing Ford magneto without injuring lubrication. 6—Method of lowering rear springs, using original springs.

(10) Nocona, Tex.

Q. S. G.

—This can be obtained from E. R. Noonan, Paris, Ill

2—Refer to 1.

3—It will not be necessary.

4—We would advise using aluminum pistons, but we would not advise drilling holes in the connecting-rods.

5—Only the magnets of the magneto should be removed.

6—Cut off the frame 4 in. from the rear end, and support the rear spring cross-member with angle irons.

???

**Q** uery—Horsepower curve of Lozier light four type 84, 1914 model, built on raceabout lines, weighing 3600 lb., geared 3 to 1 on direct. 2—Would aluminum pistons of good alloy, such as Lynite, raise the effective revolution per minute to any appreciable extent? 3—Would it be feasible to substitute for the roller in the rocker that rides between the cam and valve lifter a suitable piece of steel with the side of same that touches the cam finished almost flat? A quicker opening of the valve would result, but would it result in very much power increase? 4—The portion of the intake manifold outside block is 1½ in. in diameter with the cored-in portion about 2 in. in diameter. Zenith 1½ in. carbureter installed. Would not an air valve, hand operated, in conjunction with a larger main jet, give the effect of a larger carbureter?

(13) Chazy, N. Y.

R. J. M.

—The following figures will give the characteristics of the curve:

600 r.p.m. 25 hp  
1000 r.p.m. 42 hp  
1500 r.p.m. 52 hp  
1800 r.p.m. 55 hp.

1800 is the peak of the curve.

2—Probably not.

3—It is very doubtful if the gain would be appreciable.

4—Probably not. In any case it would be cumbersome.

A device much used in Europe consists of a ¾ in. hole drilled in the intake manifold on the engine side of the throttle. From this a copper pipe is carried to a convenient place on the steering column and a cock with about ¾ in. bore forms the end. This allows additional air to be admitted when running fast and generally cuts the gasoline consumption, but it has to be manipulated continually.

???

**Q** uery—Wiring diagram of electric and ignition system, also carbureter of Hudson Super Six.

(19) Fillmore, Cal.

E. C. K.

—Wiring diagram of electric system and carbureter of Hudson Super Six illustrated below and on next page.

???

**Q** uery—Would the chassis of a model 34 Oakland stand the increase in power if a Rutenber model 25 motor with Brown-Lipe transmission were substituted for the motor and transmission now used? 2—Brake horsepower of Rutenber 25, Northway 108 and Falls model J at 1600 and 2000 r.p.m. 3—Length of spring centers of model 34 Oakland front and rear and of Franklin runabout.

(15) Syracuse, N. Y.

H. E. M.

—It would be very unsafe to put so large a power plant in the Oakland 34 chassis.

2—Rutenber 41 and 44 hp., Northway 32 and 38 hp., Falls 26 and 33 hp.

3—Front 35 in., rear 51 in. on the Oakland, and on the Franklin 36 in. both front and rear.

???

**Q** uery—Can 35 by 4½ in. tires be fitted on 34 by 4 in. rims?

(20) Emporium, Pa.

J. H.

—Yes, they are the standard oversize.

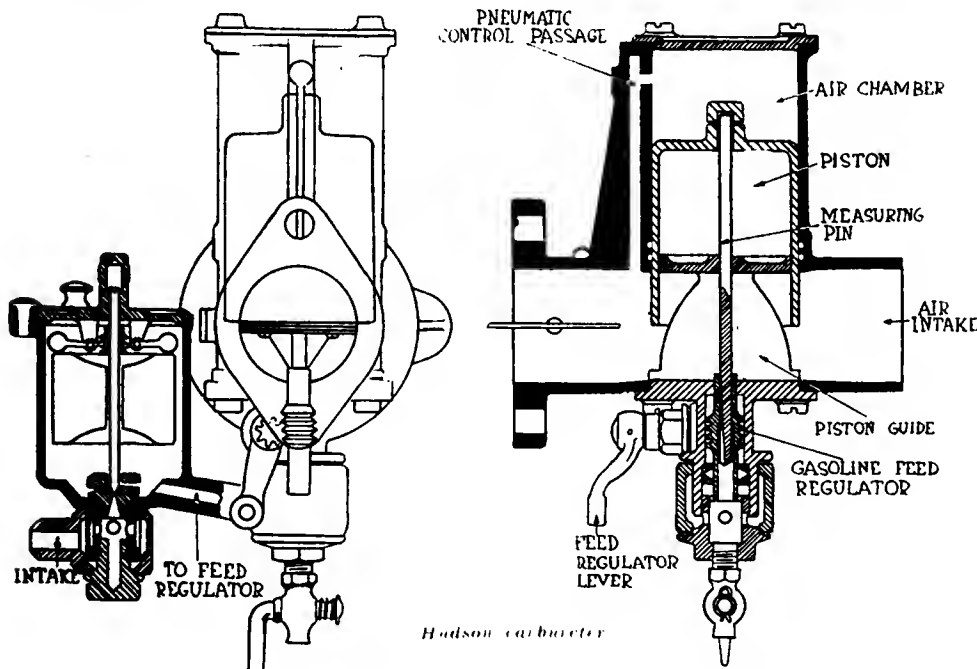
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**Q** uery—Highest average temperature of cylinders of an automobile such as the Franklin and racing cars.

(21) Los Angeles, Cal.

L. D. C.

—About 200 deg. Fahr.



Query—How to remedy oil getting past piston rings into combustion chamber and fouling plugs forming carbon in 1916 Studebaker. Could the pistons be taken out through the bottom of the crankcase without taking cylinder off?

(16) New York City. J. B. J.

—Possibly your piston rings are worn and require renewal. It is possible that the splashers on the lower ends of the connecting rods are dipping too deeply in the oil. Take the matter up with the Studebaker service station.

???

Query—How foot brakes can be made to give better retardation on 1913 Pierce-Arrow weighing about 5000 lb. Have just relined them with Raybestos, but have the same trouble when stopping.

(17) Radnor, Pa. R. A. C.

—After relining readjustment is soon required since the fabric beds down somewhat. If relining is properly done the brakes should be in proper condition after about 300 miles driving.

???

Query—Difference in the winding of the ignition coils on two, four, six, eight or twelve-cylinder engines? 2—Difference in the condenser in these coils? 3—Diagram showing the internal winding of the 1916 Wagner generator? 4—The Dyneto motor-generator has six poles, three series field and three shunt. How do they control each other? 5—What are the weights of the general run of racing cars?

(14) Philadelphia, Pa. C. T.

—No difference. Only one is used in any case. The difference occurs in the number of times the primary circuit is made and broken during a revolution of the crankshaft.

2—No. The condenser is in the same situation as the coil.

3—The Wagner company makes several types of generator and will make practically any designs asked for. If you have any particular machine in mind please specify it.

4—The connections are such that the excitation of the series fields opposes that of the shunt fields as the speed of the generator increases. When the machine is operating as a motor the two work in harmony.

5—From 2000 to 2500 lb.

???

Query—How to test cylinder oil to tell if it is good. 2—Weight of the new four-cylinder Studebaker. 3—Advantages of disk clutch over cone, and vice versa. Which is best, one with few disks or with many and why? 4—Reason for motor pounding when hot. 5—Could I admit water through V air valve attached to manifold to remove carbon?

(18) Bouton, Iowa. C. M.

—Testing cylinder oil except by using it is a very compli-

cated laboratory process requiring considerable expensive equipment. In any case, the final test is the use of the oil in an engine. There is no easy test for an amateur.

2—Studebaker manufacturers state this to be 2770 lb. for the touring car.

3—This is a much debated subject on which no agreement has yet been reached. The cone is simpler, the disk is lighter and easier to reface. The number of disks when large gives the lowest pressure per square inch required, but few disks usually "free" more readily with less pedal movement.

4—Probably due to pre-ignition caused by carbon.

5—You cannot remove carbon already deposited by adding water. Better have the engine torn down and scraped.

???

Query—Method of adjusting Marvel carbureter on 1916 Buick light six. After cleaning this has been troublesome at between 15 and 20 m.p.h. 2—Advisability of retreading tires when fabric is cut.

Mentor, Ohio.

A. M. B.

—The air valve in the Marvel carbureter should fit tightly against the wall of the chamber and must not touch the high speed jet when it is in this position.

2—No, not if the fabric is either cut or rotted.

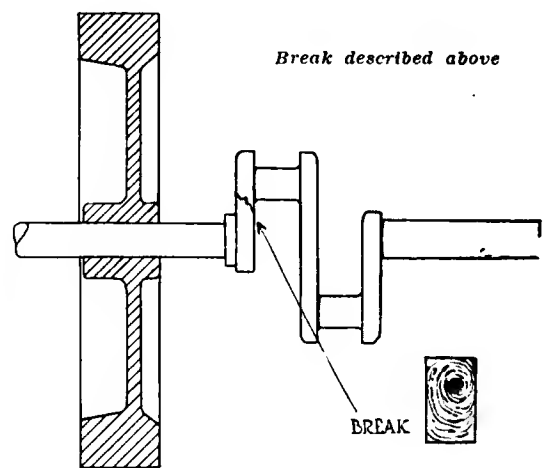
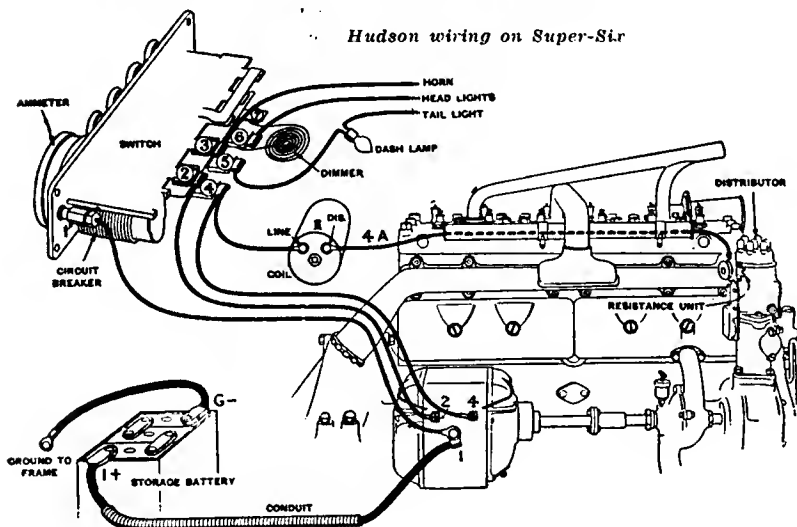
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Communication—Among the multitude of troubles that an automobile driver has to deal with, bearing trouble certainly can be given a prominent place. When, however, this bearing trouble cannot be remedied by adjustment, cleaning of the oil holes or use of better oil, it becomes a regular menace. Such a peculiar case showed the following symptoms: The bearing next to the flywheel would heat for a day or two and then would not heat for a few months. Then all of a sudden it would repeat its trick. It was found that the heating occurred as a rule after the engine had been working hard, as for instance, after climbing a steep hill. The course of this trouble was not located until one day the crankshaft broke. The break clearly showed by a series of rings that it had taken several months before the shaft finally gave out. This explained the heating of the bearing. After a sudden strain the shaft would be slightly bent and it would take several days before it would have worn down the bronze bearings sufficiently to obtain a large enough surface that would not heat.

The accompanying illustration shows the place where the break occurred and also shows a cross section of the break. It is interesting to note that the final break did not occur in the center but in the right hand upper corner, this being due to the uneven strain caused by the explosions.

(11) New York City.

A SUBSCRIBER.



# Industrial Miscellany

## Factory

Ohio Forge Co., Cleveland, has purchased 4 acres of land which will be used for the location of a new plant to be erected at a cost of \$100,000.

Fisk Rubber Co., Chicopee Falls, Mass., has started moving into its new mill, which is 600 ft. long, 105 ft. wide and has six floors.

Star Rubber Co. at Akron, Ohio, has started production in its plant, and every effort is being made to place the factory upon a basis of complete production as rapidly as possible.

Willys-Overland Co. will add 200 employees within the next week to its branch in Elyria, Ohio, to increase the

capacity of the plant to meet the heavy demands now being made on it.

Apperson Brothers Automobile Co., Kokomo, Ind., has completed the last of the new buildings and has succeeded in transferring all of the machinery from the old plant to the new. The new plant gives it an additional floor space of nearly 500,000 sq. ft., and practically doubles the acreage of its buildings. Nearly \$300,000 has been invested in new machinery and the buildings themselves.

Reo Motor Car Co. employees have arranged a plan to reduce the cost of winter motoring in Lansing, Mich. They designate certain individual workers to use their cars for specified periods, and these drivers pick up all other employees on their way to the factory. Once a week

operating expenses and repair bills are audited and the total pro-rated among the riders. The owner of the car has the use of it at all other times.

Lasure Friction Clutch Pulley Co., Charles City, Iowa, manufacturing clutch units for gasoline engines, has moved its plant and general offices to Madison, Wis. The factory at 619 Williamson Street, Madison, has been equipped and is now producing fifty clutch pulleys daily.

W. A. Walker Mfg. Co., Racine, Wis., recently moved into its new plant at North Michigan and Hamilton Streets and is now operating with increased forces. The payroll has been increased from 100 to 150.

Gilson Mfg. Co., Port Washington,

## The Automobile Calendar

ASSOCIATIONS	
Jan. 24-26 — Chicago, Second Annual Meeting National Assn. of Automobile Accessory Jobbers. Congress Hotel.	Jan. 23-27 — Baltimore, Md., Show, Fifth Regiment Armory.
CONTESTS	
1917	
April—Los Angeles to Salt Lake City Road Race.	Jan. 24-27—Lewiston, Pa., First Annual.
May 19—New York Metropolitan Race on Sheepshead Bay Speedway.	Jan. 24-29—Charleston, W. Va., Armory.
May 30—Indianapolis Speedway Race, Championship.	Jan. 25-27—Asheville, N. C., Show, Asheville Automobile Trade Assn.
June 9—Chicago, Ill., Speedway Race, Championship.	Jan. 27-Feb. 3—Richmond, Va., First Annual, Gray's Armory.
June 23 — Cincinnati, Ohio, Speedway Race.	Jan. 27-Feb. 3—Columbus, O., Show, Memorial Hall, Columbus Dealers' Assn.
July 4—Omaha, Neb., Speedway Race, Championship.	Jan. 27-Feb. 3, 1917—Chicago, Ill., Show, Coliseum, National Automobile Chamber of Commerce.
July 4—Tacoma, Wash., Speedway Race, Championship.	Jan. 27-Feb. 3—Portland, Ore., Eighth Annual, Dealers' Motor Car Assn. of Oregon.
July 14 — Des Moines, Iowa, Speedway Race, Championship.	Jan. 27-Feb. 5 — York, Pa., Show, York Automobile Dealers' Assn.
Aug. 4—Kansas City Speedway Race.	Jan. 28-Feb. 3 — Wilmington, Del., Show, Hotel duPont.
Sept. 3—Cincinnati, Ohio, Speedway Race, Championship.	Jan. 29-30—London, Ont., Victor Carty, Mgr.
Sept. 15 — Providence, R. I., Speedway Race, Championship.	Feb. 3-10—Minneapolis, Minn., Show, Minneapolis Automobile Trade Assn.
Sept. 29—New York, Speedway Race, Championship.	Feb. 5-9—Boston, 8th National Good Roads Show, Mechanics' Bldg.
Oct. 6—Kansas City Speedway Race.	Feb. 5-10—Indianapolis, E. W. Steinhart Bldg., Indianapolis Automobile Trade Assn.
Oct. 13 — Chicago, Speedway Race.	Feb. 5-10—Bangor, Me., Bangor Automobile Assn., Auditorium.
Oct. 27—New York Speedway Race.	Feb. 5-10—Indianapolis, Ind., Indianapolis Automobile Trade Assn., Steinhart Bldg.
SHOWS	
Jan. 20-27 — Montreal, Que., Almy Bldg., Automobile Trade Assn.	Feb. 7-10 — Bay City, Mich., Automobile and Accessories, Armory, F. D. Shaver, Mgr.
Jan. 20-27—Detroit, Mich., 16th Annual Show, Detroit Automobile Dealers' Assn.	Feb. 7-11 — Kalamazoo, Mich., State Armory, Kalamazoo Automobile Dealers' Assn.
Jan. 22-27—Rochester, N. Y., Show, Exposition Park, Rochester Auto Trades Assn.	Feb. 8-15—First Pan-American Aeronautic Exposition, New York City; Aero Club of America, American Society of Aeronautic Engineers, Pan-American Aeronautic Federations.
Jan. 22-27—Manchester, N. H., Academy.	Feb. 10-17 — Harrisburg, Pa., Harrisburg Automobile Dealers' Assn., J. Clyde Myton, Mgr.
Jan. 22-27 — Buffalo, N. Y., Show, Broadway Auditorium, Buffalo Automobile Dealers' Assn.	Feb. 10-17 — Hartford, Conn., Show, State Armory, First Infantry.
Jan. 22-27—Scranton, Pa., Board of Trade Bldg., H. B. Andrews, Mgr.	Feb. 10-18—San Francisco, Cal., Pacific Automobile Show, G. A. Wahlgreen, Mgr.
Jan. 23-27—New Bedford, Mass., State Armory, Stephen W. Pierce, Mgr.	Feb. 12-17 — Bay City, Mich., Show, Armory.
Jan. 23-27 — Oklahoma City, Okla., Show, Auditorium.	Feb. 12-17 — Louisville, Ky., Show, First Regiment Armory, Louisville Automobile Dealers' Assn.
	Feb. 12-17—Toledo, O., V. G. Kibby, 1017 Jefferson Ave.
	Feb. 12-19 — Indianapolis, Ind., Show, Steinhart Bldg., Indianapolis Automobile Trade Assn.
	Feb. 13-15—Grand Forks, N. D., Auditorium, Automobile Dealers' Assn.
	Feb. 13-17 — Williamsport, Pa., Armory, John Kelly, Mgr.
	Feb. 14-17—Peoria, Ill., Coliseum, Automobile and Accessory Dealers' Assn.
	Feb. 15-17—Racine, Wis., Chas. A. Myers, Mgr.
	Feb. 17-24—Albany, N. Y., Sixth Annual, State Armory, Albany Automobile Dealers' Assn.
	Feb. 17-24 — Newark, N. J., Show, First Regiment Armory.
	Feb. 18 - 25 — St. Louis, Mo., Show, Automobile Manufacturers' and Dealers' Assn.
	Feb. 19-24 — Springfield, Ohio, Show, Memorial Hall, Springfield Automobile Trade Assn.
	Feb. 19 — Pittsfield, Mass., Show, Armory, J. J. Callahan, Mgr.
	Feb. 19-24—Portland, Me., Exposition Building.
	Feb. 19-24 — Grand Rapids, Mich., Show, Automobile Business Assn. of Grand Rapids.
	Feb. 19-24 — Duluth, Minn., Show, Duluth Auto Dealers' Assn., Armory.
	Feb. 19-24 — South Bethlehem, Pa., Show, Coliseum.
	Feb. 19-24—Bridgeport, Conn., Show, Armory, Coast Artillery Corps.
	Feb. 19-24—St. Louis, Overland Bldg., St. Louis, Auto Dealers' Assn.
	Feb. 19-24—Syracuse, N. Y., Show, State Armory, Syracuse Dealers' Assn.
	Feb. 19-24—Pittsfield, Mass., J. J. Callahan, Mgr.
	Feb. 21-24—Flint, Mich., Coliseum, Lake Side Park, E. W. Jeffers, Mgr.
	Feb. 24-March 3 — Brooklyn, Show, 23rd Regiment Armory.
	Feb. 24-Mar. 3—Atlanta, Ga., Automobile Dealers' Assn., Auditorium.
	Feb. 26-March 3—Omaha, Neb., Show, Auditorium, Omaha Automobile Show Assn.
	Feb. 26-Mar. 3—Utica, N. Y., Utica Automobile Dealers' Assn., State Armory.
	Feb. 26-Mar. 3—Wilkes-Barre, Pa., Hugh B. Andrews, Mgr.
	Feb. 27-March 4—Atlanta, Ga., Show, Auditorium, Atlanta Auto Trades and Accessory Assn.
	March 1, 2, 3 — Urbana, Ill., Show, Automobile Trade Assn. of Champaign Co., Armory of the University of Ill.
	March 3-10 — Boston, Mass., Show, Mechanics' Bldg., Boston Automobile Dealers' Assn.
	Mar. 3-10—Washington, D. C., Middle Atlantic Motor Assn., Inc., Union Bldg.
	Mar. 5-10—Jamestown, N. Y., James town Automobile Dealers' Assn., Armory. C. A. Hanvey, Mgr.
	Mar. 6-9—Fargo, N. D., A. Hanson, Mgr.
	March 6-10—Ft. Dodge, Iowa, Northern Iowa Show, New Terminal Warehouse, G. W. Tremain, Secretary.
	March 7-10—St. Joseph, Mo., Auditorium, St. Joseph Automobile Show Assn.
	March 13-16 — Fargo, N. D., Armory and Auditorium.
	March 14-17—Mason City, Ia., Armory, Mason City Automobile Dealers.
	March 14-17—Davenport, Iowa, Show, Coliseum Bldg., Tri-City Auto. Trade.
	Mar. 14-17—Trenton, N. J., J. L. Brock, Mgr.
	March 17-22 — New Haven, Conn., Show, Hotel Taft.
	Mar. 17-24—Pittsburgh, Pa., Motor Square Garden, J. J. Bell, Mgr.
	March 18-23—Cedar Rapids, Ia., Cedar Rapids Automobile Trades Assn.
	April—Calumet, Mich., Show, Coliseum, Frank Ketchell, Mgr.
	Apr. 4-7—Stockton, Cal., Second Annual San Joaquin Auto Trades Assn., Samuel S. Cohn, Mgr.
	Sept. 2-9—Spokane, Wash., Interstate Fair.

Wis., is developing multiple-cylinder engines for use in tractors, trucks and pleasure cars, according to report on good authority. William Baumbeckel, tractor engineer, joined the Gilson company Jan. 1 and, it is stated, will devote his time to designing the new line of motors.

Garford Motor Truck Co., Lima, Ohio, has leased a two-story building at 1708-10 Main Street, Kansas City, and will establish a branch factory.

Peerless Tire & Rubber Co., Green Bay, Wis., has been organized with \$50,000 capital stock by F. E. Burrall, John P. Jessen and A. W. Brown. It is planned to establish a tire plant in Green Bay by absorbing a company now operating in Ohio.

Progressive Metal & Refining Co., Milwaukee, has broken ground for the first unit of a new plant to afford nearly 55,000 sq. ft. of floor space.

Elyria Iron & Steel Co., with factories at Cleveland, Ohio, and Elyria, Ohio, has completed a large addition to its Cleveland tube mill, which increases its capacity approximately 12,000,000 ft. per year.

The American Forging Co., Birmingham, will install apparatus for making automobile forgings. R. I. Ingalls is president.

Standard Aluminum Co., Two Rivers, Wis., has completed work on a new smelter unit.

Chalmers Motor staff at Detroit is forming an organization to meet daily at dinner in the enlarged convention hall of the company. Plans for this enlargement are already made, and the club will have a special table in the form of a horseshoe, around which they will gather. The daily assemblage will include department heads and men prominent in the administration of the company. Prominent speakers will deliver addresses.

Auto Safety Light Co., Dayton, Ohio, has been formed to manufacture a safety control for automobile headlights. The men at the head of the company are G. F. Dadey, George Holland, G. T. Deal and J. M. Weigand.

Cook Railway Signal Co., Denver, has reorganized and is now in Chicago under the name of the International Electric & Signal Co.

Brown Motors Co., Moline, Ill., will manufacture an annular-valve gasoline and commercial motor for pleasure and commercial vehicles.

National Automatic Tool Co., Richmond, Ind., will build a second addition on its plant for storage and painting of castings.

McFarland & Westmont Tractor Co., Sauk City, Wis., has leased a factory building and equipment, where it will manufacture a new steel tractor.

Portland Body Works, Portland, Ind., will erect a three-story factory costing \$15,000.

Auto Safety Light Co., Dayton, Ohio, has been formed by G. F. Dadey and others for the manufacture of automobile specialties.

C. A. S. Products Co., Columbus, Ohio, has secured a contract for 20,000 steering gears from the Harroun Motor Co., Cleveland.

Goodyear Tire & Rubber Co., Akron, has formed a Cosmopolitan Club for its alien employees to teach them American ideals and urge them to qualify for citizenship in the United States.

Blackwell Welding Co., Dayton, will occupy a new building in Toledo, which will be used for machine and store rooms.

Miller Rubber Co., Akron, Ohio, has secured a permit to erect a \$20,000 factory.

Bour-Davis Reflector, Volume One, Number One, has been issued as the house organ of the Bour-Davis Motor Car Co., Detroit.

## Personals

F. L. Good has become manager of the wholesale department of the Chicago Motor Car Co., distributor of the Jordan line for territory in Illinois and Indiana. He was formerly general district manager of the Paige-Detroit Motor Car Co., Detroit.

Van N. Marker has again been placed in charge of the Chicago territory of the Adams-Bagnall Electric Co., Cleveland. His headquarters are Machinery Hall, 549 West Washington Boulevard.

H. H. Harwood has been appointed manager of the truck department of the Northwest Buick Co. He will have entire charge of the company's sales of the G. M. C. trucks, Bull tractors and Warner trailers.

O. L. Weaver will be in charge of the exhibition of the Star Rubber Co., Akron, which is to be held in the Auditorium Hotel of that city during the Chicago national automobile show. The company will make exhibits at the Minneapolis, Kansas City and other shows, at all of which there will be shown a complete line of the Star hand-made tires.

Daniel Zeisloft, formerly with the Marathon Tire & Rubber Co., has joined the sales force of the Star Rubber Co., Akron.

J. I. Case T. M. Co., Racine, Wis., has decided to appoint no successor to O. R. Randall, manager of the Middle Western sales division, who resigned Jan. 1 to engage in the automobile and tractor business at Atlanta, Ga., and will distribute the sales work among the remaining division managers.

George P. Sweet of Detroit, son of E. F. Sweet, assistant secretary of commerce, has been sent to Paris to arrange foreign business details for American automobile makers with the French government.

G. P. Miller, secretary and treasurer of the Hokanson Automobile Co., Madison, Wis., has been appointed general agent of the Nash Motors Co., Kenosha, Wis., for the major part of the central section of the Mississippi valley. Mr. Miller will have charge of the distribution of Jeffery cars and Jeffery Quad trucks throughout the territory.

W. H. Masten, formerly sales manager with the Moline, Ill., Plow Co., has resigned to join the sales staff of the Oakland Motor Car Co., Pontiac, Mich.

E. R. Hollender will manage the New York store of the Jennings Motor Sales Co., which has recently closed for the agency for the Hal.

La Crosse Rubber Co., La Crosse, Wis., is increasing its force of traveling salesmen to include the entire United States territory. The latest appointment is that of Henry Olmstead, Escanaba, Mich., to whom has been assigned the Nebraska and Kansas territory.

R. S. Hartzell has been appointed state representative for Ohio of the Goodyear Tire & Rubber Co., Akron. He has been manager of the Cleveland branch of the company for 4 years. F. N. Hammond succeeds Mr. Hartzell. Mr. Hammond

was formerly manager of the Youngstown branch.

Richard Bacon has resigned from the sales department of the Hudson Motor Car Co., Detroit, to form a corporation to handle Chalmers cars at Minneapolis.

A. R. Griffin has been appointed production and general factory manager of the Kellogg Mfg. Co., Rochester, N. Y. He was for some years with the Studebaker Corp. and more recently with the Timken company, Detroit.

Ben Goldberg, formerly of the Brooklyn *Daily Eagle*, has joined the advertising division of the Chevrolet Motor Co.

## Dealers

Willys-Overland, Ltd., West Toronto, Canada, has established a third factory branch at Winnipeg to serve forty dealers in Manitoba. The Winnipeg branch will have a floor space of 32,000 sq. ft.

H. W. Johns-Manville Co. has opened a new office in Des Moines with W. B. Roberts in charge. This makes the total number of branches fifty-five.

Fisk Rubber Co., Chicopee Falls, Mass., has purchased a site at 210-212 South Pinckney Street, Madison, Wis., for a proposed branch house in the capital city of Wisconsin to be 56 by 120 ft. in size, two stories and basement.

New York Show changes made in agencies are as follows in New York:

The Pathfinder Co. of New York has been formed to handle the Pathfinder and offices and salesroom established at 1620-24 Broadway. J. P. Hilands is president and general manager of the company.

Hal is to be handled by the Jennings Motor Sales Co., which has opened a salesroom at 1891 Broadway. It is in charge of E. R. Hollender.

Auburn will be handled by F. W. Wright, Inc. Offices and salesrooms have been located at 1793 Broadway. The company includes F. W. Wright, J. W. Gothard and W. S. Maltby.

Peerless will be handled in Brooklyn, N. Y., by the L. A. D. Motors Corp. The company will distribute in Kings and Queens counties.

Packard Motor Car Co., Detroit, Mich., has purchased property valued at \$180,000 in Newark, N. J., as a site for a building to be used for the northern New Jersey headquarters.

Hood Tire Co., Watertown, Mass., has opened a factory branch in Atlanta, Ga. I. W. Hill is district sales manager of the Southeastern territory and will make his headquarters in Atlanta.

Ford Motor Co. of Milwaukee, has enjoyed an increase of 400 per cent in sales here since Aug. 1, when the new sales policy was inaugurated and the branch was discontinued.

Polack Tire & Rubber Co. will give up its Philadelphia branch at 1906 Market Street and will turn the territory over to Maxwell Smollen, its present manager.

Death & Watson, Ltd., Toronto, has become the Rosedale Motors, Ltd., and with the reorganization of the firm the company assumed the Ontario agency for the Jordan in addition to the Marmon.

Kellogg Mfg. Co., Rochester, N. Y., which manufactures engine-driven tire pumps, has opened a branch at 719 Jefferson Avenue, Toledo, with E. E. Kirk as manager.

Prest-O-Lite Co., Indianapolis, established sixteen new battery-service stations in various sections of the United States during the week ending Jan. 13.

# BOUND BROOK

Trade Mark Reg. U. S. Pat. Off.

## Oil-less Bushings

### In the Water Pump

It is a conceded point among all car manufacturers that a good *Oil-less* bushing, when properly placed, is the most efficient and superior type of bushing that can be used.

For there are certain bushings in every car that are difficult or impossible to keep properly lubricated.

And any plain bushing that is not kept properly and continually lubricated, *wears out fast*.

For this reason you will find incorporated in all quality built cars and trucks a number of *Genuine Graphited Oil-less Bushings*.

Oil-less Bushings require no lubrication to give efficient service, for they contain within themselves sufficient lubrication to last their lifetime.

They are *oiled for life* when they leave the factory, and thereafter require no further attention.

In the center of the AUTOCAR Water-pump illustrated above are two BOUND BROOK *Oil-less Bushings*.

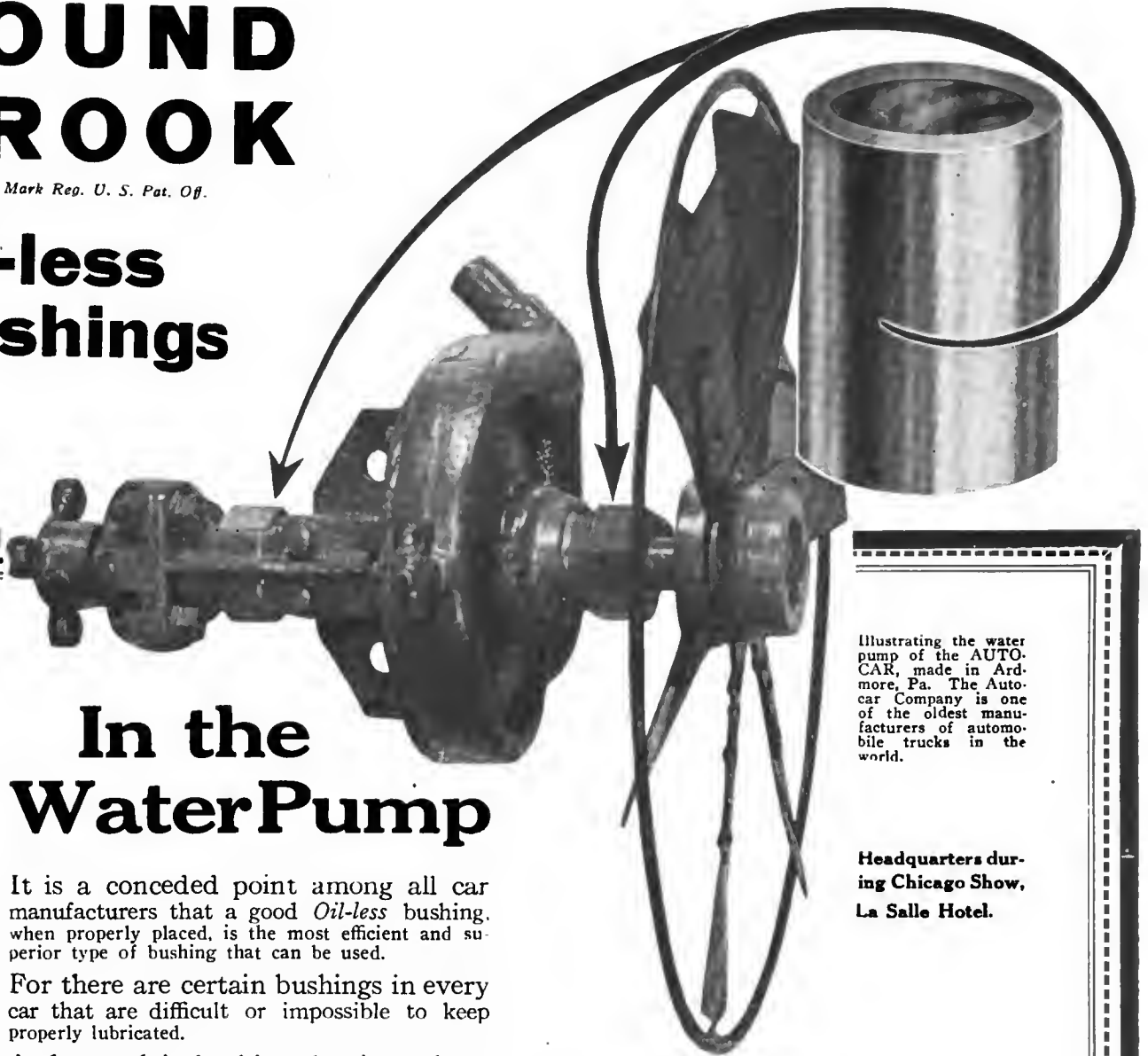
All genuine Graphited Oil-less Bushings have always been made at Bound Brook, U. S. A.

## BOUND BROOK OIL-LESS BEARING COMPANY

Specialists in the Manufacture of Oil-less Bearings for more than a Third of a Century

BOUND BROOK

NEW JERSEY



Illustrating the water pump of the AUTO-CAR, made in Ardmore, Pa. The Autocar Company is one of the oldest manufacturers of automobile trucks in the world.

Headquarters during Chicago Show, La Salle Hotel.

Particular attention is called to these water pump bushings, for many have thought that running in water and anti-freeze solutions was not feasible with this type of bushing.

Not only the AUTOCAR Company but a number of other well-known manufacturers as well have been using BOUND BROOK "*Graphite and Bronze*" Oil-less Bushings in their water-pumps for years with the greatest of success.

Experience has proven that BOUND BROOK Oil-less Bushing conserve the life of the shaft and thereby greatly add to the efficiency and service life of the pump.

Bound Brook Oil-less Bushings are made only "to order."

# GUTS

A poor word in print, maybe, but who knows a word which is more expressive of those parts of a motor car which are way inside, can't be seen and yet determine the machine's ability to give service—its endurance.

Your motor car or motor truck must **work**. That's what you bought it for—**work**.

How can it **work** and **keep on** working if its **guts** are poor?

The guts of a machine are those parts which are subjected to wear. As long as these parts *resist* wear the machine keeps on working.

## Therefore—

When you *buy* a machine—Truck, pleasure car or any other kind of machine, make sure of the quality of its *guts*—its *wear-subjected, non-adjustable bearing parts*.

## And—

When you overhaul your present car to renew these wornout bearings and bushings make sure of the quality of the *new* ones you give them. The better the quality of these new bearings and bushings, the longer it will be before you will have to do the job all over again.

Non-Gran Bushings cost more, but they *keep* your machines *working*.

Practically all high grade quality-built cars are Non-Gran equipped when they leave the factory.

Practically every Taxicab Company in North America and most of the owners of large truck fleets use Non-Gran exclusively when making new bushings at overhauling time. They cannot be sold any other metal for this work.

All leading garages and repair shops carry an assortment of Non-Gran cored bars from which to make their bushings for renewals.

Non-Gran cored bars are for sale by leading jobbers everywhere.

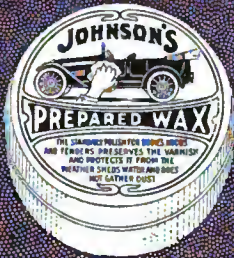
**American Bronze Company**

Berwyn

Pennsylvania

HIGH SPEED  
**NON-GRAN**  
 BEARING BRONZE

# JOHNSON'S AUTOMOBILE PRODUCTS



**JOHNSON'S  
PREPARED WAX**

THE STANDARD PREPARED FOR BODIES, WHEELS AND FENDERS. PRESERVES THE FINISH AND PROTECTS IT FROM THE WEATHER. SHIELDS METAL AND PAINT FROM RUST AND CORROSION.

Protects and preserves the finish. Impervious to dust, water, weather, etc.



**JOHNSON'S  
CARBON  
REMOVER**

FOR  
GASOLINE  
ENGINES  
Motor Cars  
Motorcycles  
Automobiles  
Spark Plugs

MADE AND GUARANTEED BY  
S. C. JOHNSON & SON  
RACINE, WIS., U.S.A.

Cures 80% of engine troubles. The safest, easiest and quickest method.



**JOHNSON'S  
CLEANER**

FOR  
AUTOMOBILES

**JOHNSON'S  
CLEANER**

Removes spots, road-oil, scum, etc. from body, hood and fenders.

**T**HEY are all manufactured for the use of the automobile owner himself—every one of them can be used by a novice with entire satisfaction. With them you can keep your car looking bright and running right. They help reduce the “up-keep.”

Johnson's Automobile products are recognized everywhere as The Quality Brand. Every one of them is bound to give satisfaction. Insist upon your dealer supplying you with Johnson's Automobile products. They are handled by all jobbers and your dealer can easily secure them for you.


For further information write  
S. C. JOHNSON & SON, Dept. A, RACINE, WIS.



**JOHNSON'S  
Stop-Squeak  
OIL**

S. C. JOHNSON & SON  
RACINE, WIS., U.S.A.

Penetrates between the leaves of springs thoroughly lubricating them.



**JOHNSON'S  
Auto-Lak**

S. C. JOHNSON & SON  
RACINE, WIS., U.S.A.

An automobile body varnish that amateurs can use successfully. Dries in 24 hours.



**JOHNSON'S  
BLACK-LAC**

S. C. JOHNSON & SON  
RACINE, WIS., U.S.A.

For renewing tops, side curtains, etc. Also touching up worn, rusty metal parts.

Please mention The Automobile when writing to Advertisers



# POVASCO

STEERING

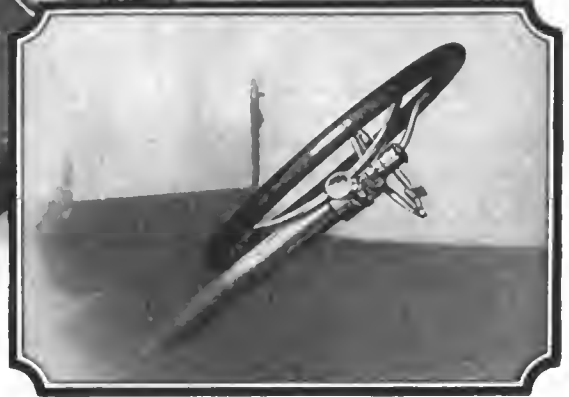
# WHEELS



Povasco  
De Luxe

The fundamental advantage of Povasco Steering Wheels is their Bakelite or Condensite construction.

Povasco  
Tilted



**E**VERY driver who has ever handled a wooden wheel, no matter how fine, can instantly appreciate the permanent, brilliant finish and the practical indestructibility of this splendid wheel. For its construction alone is a sufficient selling feature, and there is a big market for the plain Povasco Wheel.

But we go further—we make this wheel also with the cleverest tilting feature that has been shown. At will it can be tilted forward or back, either way permitting easy entrance to, and exit from, the driver's seat. The tilting feature multiplies the attractiveness of the Povasco proposition.

In a third model, instead of the tilting feature we have the Warm Hand attachment, a push button turning the heat on or off at will. You don't see it—no fussy contraptions—simply electric wiring self-contained in the moulded wheel, ready to give you heat every time you want it, at the touch of a button.

A fourth model contains both tilting and heating features. This is the De Luxe Model of the line, and was an instantaneous and continuous hit at the New York show. It is absolutely the last word in driving comfort and convenience and will create a favorable impression wherever shown and demonstrated.



Povasco  
Model L

A great proposition for distributors. You do not need much money to start, and if you want to MAKE money, and know the business, here's a great chance. Write or wire—territory closing up quickly.

Model L. Povasco with polished aluminum spider ready for machining. Finger grips—ribbed on outside. Size 18 in. Price, \$15.

Model R. Povasco with Tilting attachment. Size 18 in. Price, \$20.

Model G. Povasco Warm Hand Wheel. Size 18 in. Price, \$20.

Model H. Povasco De Luxe. Combining Tilting and heating features. Size 18 in. Price, \$25.

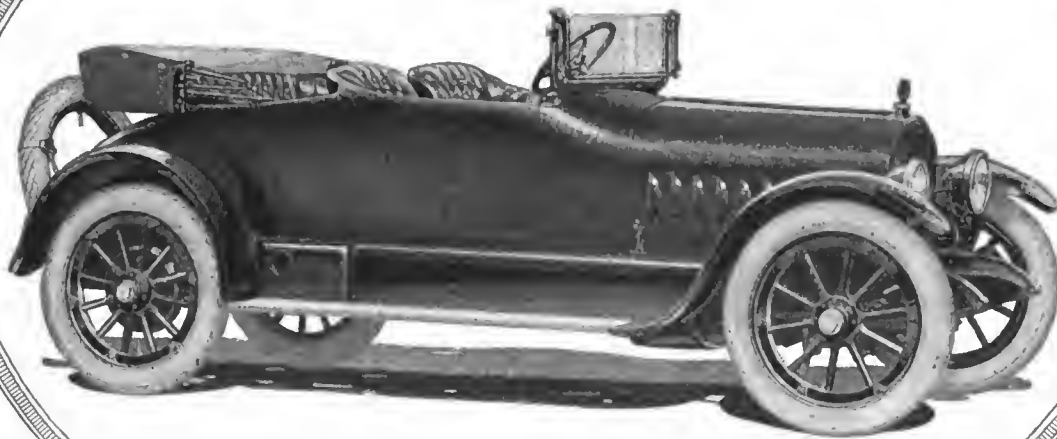
Write for Beautiful Catalog.

Exhibiting at Chicago—  
Coliseum Basement, Space 18A

**Pouvailsmith Corporation**  
Poughkeepsie New York

# Peerless Eight

*Peerless*  
All that the name implies



Two Separate Power Ranges

## The Peerless Dealer's Big Advantage

Everyone wants a really fine car—but few feel that they can afford an expensive car and a heavy operating cost.

The Peerless Eighty Horsepower Eight is recognized universally as one of the few really fine cars—yet it is not an expensive car.

And it is distinctly one of the very few truly great cars.

The Peerless dealer gives an irresistible demonstration.

The Peerless Double Power Range is as fascinating as it is practical.

It captivates the most indifferent prospective driver—makes driving a delight for even those who think they have had every motoring thrill.

And when a prospective buyer appreciates the combination of economical operation with extravagant performance—it's a sale.

Its wonderful softness, quietness and flexibility in its "loafing" range—its dash, speed and super-power in its

"sporting" range give the Peerless a contrasting performance—a dual personality—which completely captivates.

Can you think of any car with such big outstanding selling advantages?

Do you know that the success of this car has led us to double our production?

Are we represented in your vicinity?

Would you like to have a car to sell that is different and better, demonstrably so?

Write us about it.

### Prices

On orders accepted by the Factory for shipment, until February 28th, 1917, Roadster, \$1890; Touring, \$1890; Sporting Roadster, \$2250; Coupe, \$2700; Sedan, \$2750; Limousine, \$3260

On orders accepted by the Factory for shipment, after February 28th, 1917, Roadster, \$1980; Touring, \$1980; Sporting Roadster, \$2250; Coupe, \$2700; Sedan, \$2840; Limousine, \$3350

All prices f. o. b. Cleveland or subject to change without notice

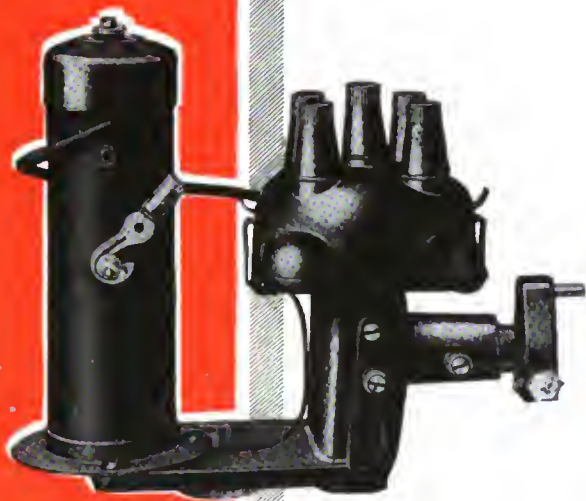
The Peerless Motor Car Company, Cleveland, Ohio

# Atwater

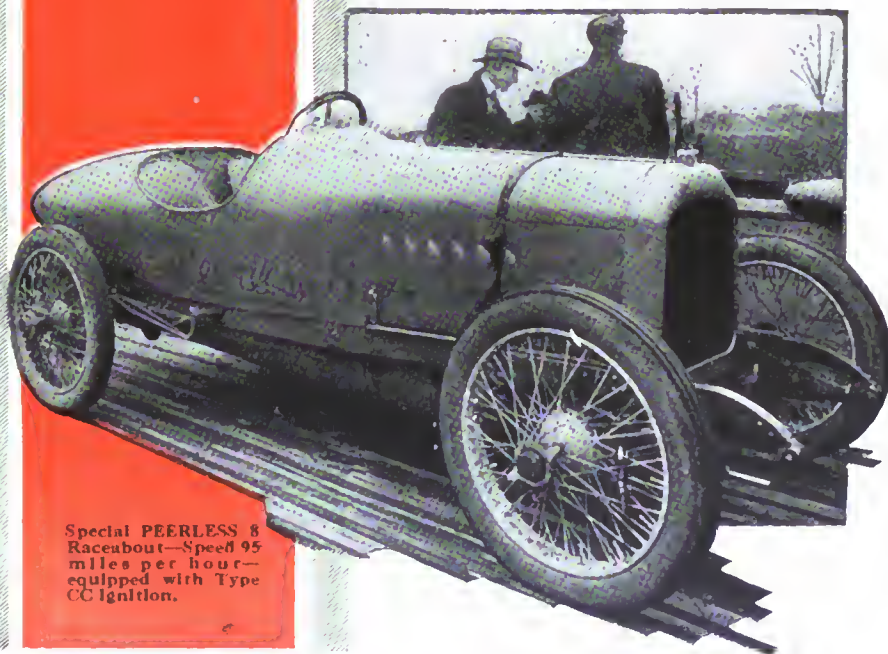
## Announcing Type CC *for*

### Magneto Replacement

This new system, the most valuable contribution to scientific ignition practice of the past year, in addition to its use as standard equipment on many of the most prominent 1917 cars, is also offered as a magneto replacement outfit.



Type CC  
For Magneto Replacement



Special PEERLESS 8  
Raceabout—Speed 95  
miles per hour—  
equipped with Type  
CC Ignition.

The Atwater Kent Type CC Magneto Replacement outfit is intended especially for Maxwell, Overland and other cars provided with electric starting and lighting.

We also offer our K-3 Magneto Replacement system for use on cars not electrically equipped.

Dealers, accessory salesmen, garage and repairmen should write at once for full detailed information.

Please mention The Automobile when writing to Advertisers

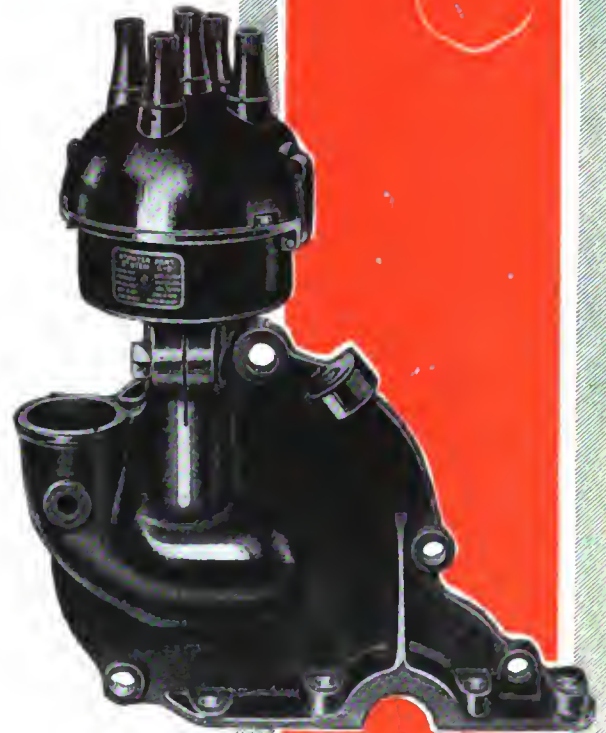
# Kent Ignition

Eighty per cent. of all makes of cars manufactured during 1917 will be equipped with battery ignition—because of its greater efficiency. Not one car manufacturer adopting this type has ever gone back to the magneto.

Atwater Kent has pioneered this movement and Atwater Kent is today the standard by which all equipment of this type is measured. Atwater Kent is the only ignition for magneto replacement which is widely advertised and sold by jobbers, dealers, garage and repair men.

Mr. Dealer: Are you the Atwater Kent authorized dealer in your territory? Are you in a position to furnish your customers with modern ignition in place of their magneto equipment? If not, write us for complete dealers' proposition and data.

Atwater Kent Mfg. Works  
Philadelphia, U. S. A.

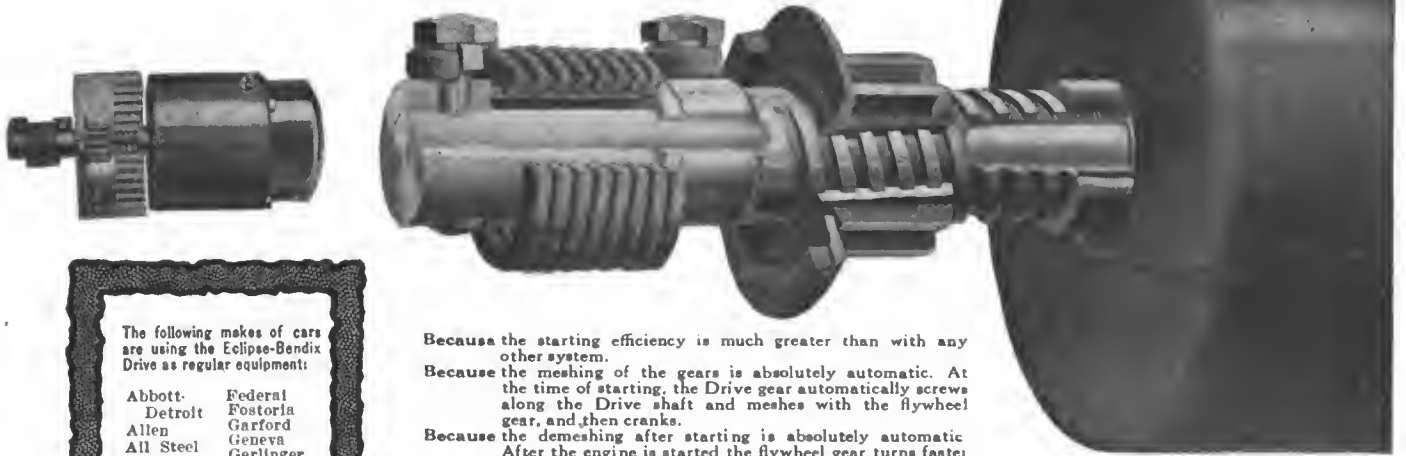


Atwater Kent System for FORD Cars.



Please mention The Automobile when writing to Advertisers

# Why have 125 Car Builders adopted the ECLIPSE-BENDIX DRIVE as Standard Equipment



The following makes of cars are using the Eclipse-Bendix Drive as regular equipment:

- |            |              |
|------------|--------------|
| Abbott     | Federal      |
| Detroit    | Fostoria     |
| Allen      | Garford      |
| All Steel  | Geneva       |
| Alter      | Gerlinger    |
| American   | Gilde        |
| Ames       | Ghent        |
| Anderson   | G.M. Truck   |
| Apperson   | Gramm-       |
| Anburn     | Bernstein    |
| Austin     | Grant        |
| Barley     | Gray-Dort    |
| Biddle     | Great        |
| Bimel      | Engle        |
| Bour-Davis | G. V. Truck  |
| Briscoe    | Hal          |
| Ben Hur    | Halladay     |
| Canadian   | Harron       |
| Regal      | Hassler      |
| Case       | Haynes       |
| Chalmers   | Imperial     |
| Chandler   | Inter-       |
| Chevrolet  | national     |
| Cole       | Interstate   |
| Columbia   | Jackson      |
| Common-    | Jordan       |
| wealth     | Kelly-       |
| Crawford   | Springfield  |
| Crow-      | King         |
| Elkhart    | Kissel       |
| Cummings   | Kline        |
| Daniels    | Lenox        |
| Davis      | Lesina       |
| Demmo      | Lexington    |
| Detroit    | Liberty      |
| Dixie      | Lipper-      |
| Dorris     | Stewart      |
| Dort       | Little Giant |
| Drummond   | Lozier Bros. |
| Duplex     | Madison      |
| Power      | Marion-      |
| Elear      | Handley      |
| Elgin Six  | McFarlan     |
| Emerson    | Meteor       |
| Empire     | M. H. C.     |
| Enger      | Mitchell     |
| Erle       | Moline-      |
|            | Knight       |

- Because the starting efficiency is much greater than with any other system.
  - Because the meshing of the gears is absolutely automatic. At the time of starting, the Drive gear automatically screws along the Drive shaft and meshes with the flywheel gear, and then cranks.
  - Because the demeshing after starting is absolutely automatic. After the engine is started the flywheel gear turns faster than the Drive gear and screws the latter back on the Drive shaft until it is out of mesh.
  - Because cast iron teeth without any chamfer not only make a great saving in cost, but are actually superior, being the simplest, most efficient and durable construction possible. The teeth are cut in the flywheel which is a natural gear blank. Stripping of these teeth by accidental starting when the engine is running is impossible, because of the automatic demeshing action.
  - Because back-fires are automatically protected by the shock absorbing spring Drive.
  - Because there is no over-running clutch to stick or slip.
  - Because there is no resistance or two-point switch to burn out.
  - Because there are no shifting levers and pedals, with their complications.
  - Because it is simpler and has fewer parts than any other starting system.
  - Because it eliminates chains, which stretch, break and get noisy.
  - Because it minimizes gear noise in cranking by driving through a spring.
  - Because it is absolutely silent when the engine is running, being absolutely disconnected.
  - Because it permits of using a simple, small generator for constant running.
  - Because it permits of cranking the engine with the most efficient of all starters—a separate electric starting motor—and also more evenly.
  - Because it makes the two-unit type of starting and lighting system superior to any other and the most popular of all.
  - Because it requires the minimum of care and attention during the life of car.
  - Because it is regularly supplied and used as standard equipment with the following starting and lighting systems, on over 125 different makes of motor cars; and also on a large number of marine and aeroplane motors.
- |                |                |                 |
|----------------|----------------|-----------------|
| A-B-C          | Gray & Davis   | Robbins & Myers |
| Allis-Chalmers | John O. Heinze | Roth Bros.      |
| Auto-Lite      | Kemco          | Splitdorf       |
| Delco          | Leece-Neville  | Wagner          |
| Detroit        | North East     | Ward-Leonard    |
| Disco          | North Western  | Westinghouse    |
| Dyneto         | Remy           |                 |

The following makes of cars are using the Eclipse-Bendix Drive as regular equipment:

- |             |            |
|-------------|------------|
| Moline Plow | Roamer     |
| Monarch     | Rockhill   |
| Monitor     | Rose       |
| Monroe      | Russell    |
| Moon        | Saxon      |
| Murray      | Scrapp-    |
| Mutual      | Booth      |
| Napoleon    | Servlee    |
| National    | S. G. V.   |
| Nelson      | Singer     |
| LeMoon      | South Bend |
| Northway    | S & S      |
| Nusco       | Stearns    |
| Oakland     | States     |
| Ogren       | Standard   |
| Oldsobile   | Stegeman   |
| Overland    | Stephens   |
| Owen        | Sterling   |
| Schoenck    | Stewart    |
| Palge       | Sun        |
| Parlin      | Thomas-    |
| Palmer      | Touraine   |
| Paterson    | Trumbull   |
| Pathfinder  | Union      |
| Peerless    | U. S.      |
| Penny       | Velle      |
| Pilliod     | Vulcan     |
| Pilot       | Wealthy-   |
| Premier     | Helghts-   |
| Princess    | Westcott   |
| Pullman     | White      |
| Regal       | Wills-     |
| Remington   | Knicht     |
| Republic    | Winton     |
| Riddle      | Wolverine  |

CHICAGO SHOW HEADQUARTERS, CONGRESS HOTEL  
ECLIPSE MACHINE CO., ELMIRA, N. Y.

Sole Agents: BRANDENBURG & CO., NEW YORK, 57th and Broadway; DETROIT, Dime Bank Building; CHICAGO, 1112 Michigan Avenue

Please mention The Automobile when writing to Advertisers



## Why Small Town Dealers Are Selling So Many Marmons

**L**ONG with a number of other theories the Marmon 34 has shattered the belief that relatively very few major class cars can be sold outside the large cities.

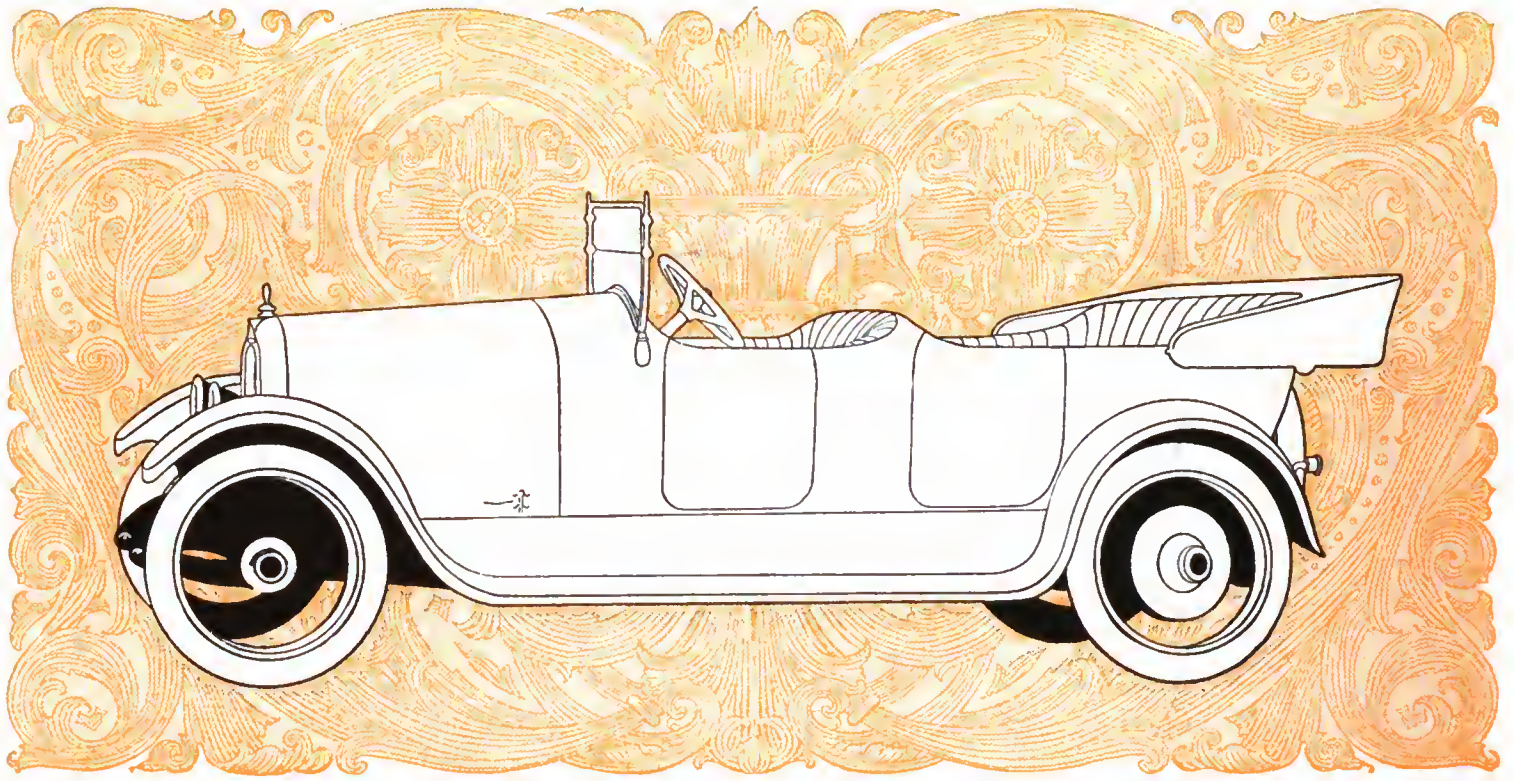
While no one expects that Smethport, Pa., (with its two weekly papers) will buy the 400 Marmons New York City took last year, it is somewhat surprising to learn that the Backus Novelty Company there sold a Marmon a month last season. But Smethport is no great exception.

Witness, if you please, the record of Mr. Jack Shaw, who sold 10 Marmons in just 7 months in one small county in Oklahoma.

Mr. Shaw and the Backus Novelty Company, could, as they say themselves, have sold about double the number they did if we could have furnished the cars.

There are many like them among the Marmon dealers. Yet why, you will ask, should this car find a market where others of its class are seldom seen?

*On the following page we give you a few of the reasons.*



# MARMON 34

## WHY THIS CAR'S MARKET IS UNRESTRICTED

**T**HE Marmon 34 weighs a half-ton less than any car of equal size and power. It consumes from 50 to 75 percent less gasoline besides; it is easy on tires, and in spite of its lightness, it holds the road at high speeds and does not sway.

Take the Marmon a thousand miles from a boulevard, and it behaves as if it were made for country roads alone. It rides with comfort and safety on the highway at 50 and 55 miles an hour. This is one of the great outstanding features that caused so much rejoicing among the lucky motorists who last summer toured in the Marmon 34—East and West.

Such attractions as these in a car with 74 brake test horsepower and 136-inch wheel-base have broken down the city market wall, beyond which, in the minds of many dealers, a car of this size was not in great demand.

The Marmon, remember, is salable anywhere and *everywhere* that there are people with the means to buy it.

At the Chicago Automobile Show note how this scientific car attracts the public.

But meanwhile, write for our proposition to dealers—regardless of the size of your community.

## NORDYKE & MARMON COMPANY

*Established 1851*

INDIANAPOLIS, INDIANA

# They All Run To BAKELITE

The manufacturers of the most prominent electric systems for automobiles realize that the success of their apparatus depends upon one feature—dependability under all conditions. Their engineers know that the moulded insulation must be strong, heat-resisting, and indifferent to oil and water. It must be capable of moulding accurately and easily and have metal inserts in exact positions, yet without high assembling costs. Therefore, they make the distributors of Bakelite. This wonderful material fulfills the specifications and besides comes finished from the mould—jet black or reddish brown.

**GENERAL  
BAKELITE  
COMPANY**

**2 RECTOR  
STREET**

**NEW  
YORK**

55-144

*Atwater-Kent  
Remy Magneto  
Westinghouse  
Vertical*

*Eisemann  
Rhoades  
Connecticut  
Delco*

**BAKELITE**  
**MOLDED INSULATION**

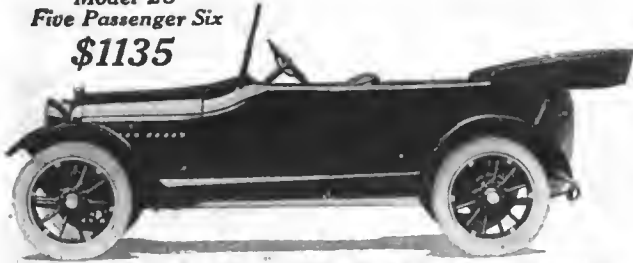
*Heinz Electric  
Westinghouse  
Horizontal*

*Wagner  
Remy Battery  
Gray and Davis  
Macnish*

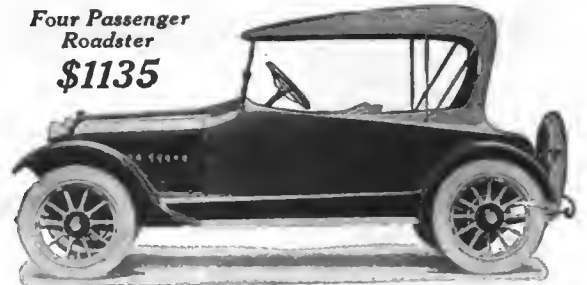
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Model 28  
Five Passenger Six  
**\$1135**



Four Passenger  
Roadster  
**\$1135**



## See Them

Until you see the new 1917 Velie Biltwel you have not seen the ultimate achievement in the light six.

With its snappy, graceful, streamline bodies—longer—roomier—upholstered in deep tufted, genuine leather and curled hair—with its long, easy riding, underslung springs—automatic ignition, push button starting—everything in and on—the new Biltwel line combines with its great power, the refined comfort and luxury that make such a strong appeal to the critical car buyers of today.

### Eight Different Body Styles

The cars here illustrated give the Velie Dealer a car for every demand. Whether your customer represents a large family or wishes a car for individual use, he or she will find just the car wanted in the Biltwel line.

With this line, and the Velie's low prices, the Velie Dealer has an unusual advantage in any market—city, town or country.

This advantage is further strengthened by the Velie's big, national advertising campaign. Full pages in Saturday Evening Post, Collier's, Literary Digest and other periodicals, with liberal space in the farm papers and newspapers, are making Velie values familiar to every car buyer in America.

## Bigger

## At The

New York Show, the Velie Biltwel cars were easily the stars of the Light Six field. Dealers and motoring public alike were quick to recognize the superior style and dignified individuality, as well as the exceptional construction that underlies the surface. Velie values are established by many years of service in the hands of owners in all parts of the world.

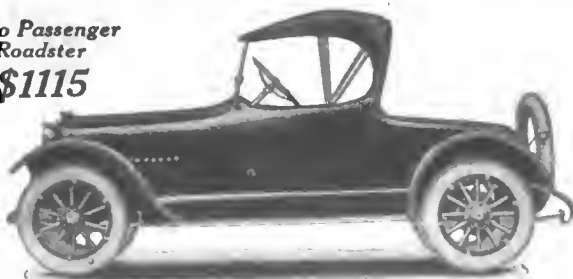
# Velie

Such features as those of the Velie, are found only in a car built up to a long-maintained standard, and not down to a price. Built by an organization of the Velie's exceptional facilities—with half a century of manufacturing experience—and a mile of Velie factory.

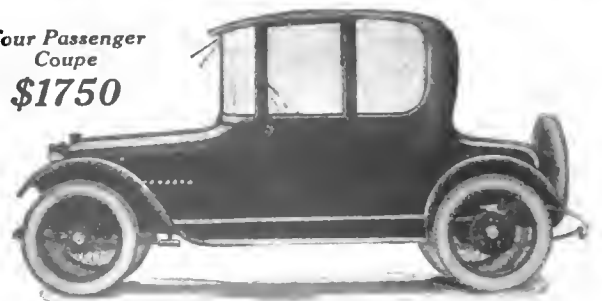
This is the most convincing assurance of Responsibility — Service — Satisfaction. "The name insures the Quality."

## Better

Two Passenger  
Roadster  
**\$1115**



Four Passenger  
Coupe  
**\$1750**



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Touring Sedan  
\$1685



Model 27  
Seven Passenger Six  
\$1600



# Chicago

will have the same beautiful display of Velie values that was so much admired by the crowds at Grand Central Palace. It will have prominent space on the main floor of the Coliseum.

Dealers and public are cordially invited to inspect these cars. Make a special point of seeing them—remember always that there is a Velie Show every day of the year at all Velie Salesrooms where stock cars may be seen.

# Show

exhibits of the Velie are the same in every respect as the stock cars, except in the use of unusual colors.

The lasting mirror finish—the genuine leather upholstery—the powerful, special Velie-Continental motor—are all there, in each car that leaves the factory.

Timken axles front and rear, are one of the high-priced features of Velie Sixes for 1917. It is only one evidence of the quality and superior specifications found throughout the car. Recognized as the standard of excellence. Money cannot buy better.

### These Features Indicate the Velie Extra Values

Six-cylinder Velie-Continental motor—Timken axles front and rear—removable cylinder head—helical gears in motor, no chains—enclosed multiple dry disc clutch—Hotchkiss drive—spiral gears in floating rear axle—Remy automatic ignition—push button starter—double bulb headlights—dashlight—all wires enclosed in metal conduits—reargasoline tank—vacuum feed—simple rocking gear shift lever—long, flexible, underslung springs—expanding tire holder—light of weight—economical of fuel.

If Velie Cars are not represented in your territory, write us. See us at the show. Or come to the factory.

Velie Motors Corporation  
114 Velie Place Moline, Illinois

# Values

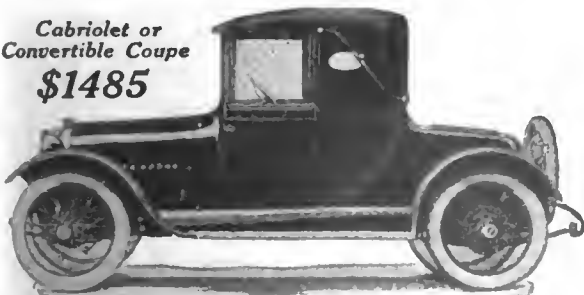
When you see these new cars you will understand why the Velie output for this year had to be tripled—why over 700 dealers have been added to the Velie sales organization—why the Velie demand is spreading wherever good cars are sold.

Month by month the demand steadily increases. In one day more than a million dollars' worth of Velie cars were contracted for at the factory.

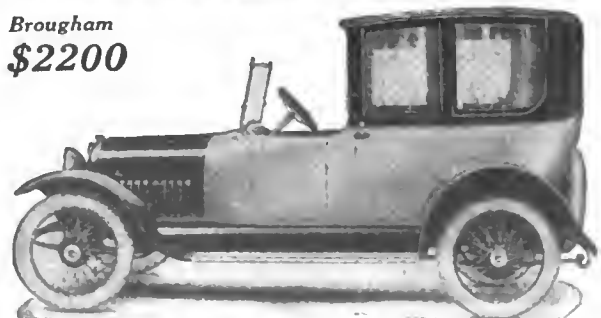
# More

# Power

Cabriolet or  
Convertible Coupe  
\$1485



Brougham  
\$2200



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# 100% Success In the Tire Business



Every man in business hopes to develop 100% of his possible sales.

For 100% is real success.

Now, how can you reach this point—say, in the tire retailing business?

Part of the 100% is made up by your personality, by your location, equipment, staff of employes and your activity.

But the rest of the 100% *depends on the kind of tires you sell.*

It's hard to determine just how this is divided, but we'll call it 50-50. Fifty per cent of your chance for complete success depends on you and 50% depends on the tires.

You can trust yourself to deliver *your half* toward the 100%. But what about the other half?

Here is where we come in. Goodyear Tires *deliver their full quota* toward the 100% success of the tire retailer.

They are the *wanted* tires—desired and purchased by more consumers than any other kind.

They are the tires of *satisfaction*—holding your customers after you get them.

They are the *business-getting* tires—sending new

buyers to you and giving you the chance to sell each new buyer everything you handle.

With a tire less capable and less popular you cannot attain 100% of your possible sales.

You might deliver *your full quota* toward this limit, but if the tires could not deliver their part you never would reach the point.

And why be satisfied with less than 100%?

The Goodyear Tire & Rubber Company, Akron, Ohio

GOOD YEAR  
AKRON



# JOHNSON CARBURETOR

**The Carburetor  
for the Discriminating Motorist**

**JOHNSON COMPANY**

Makers of Superfine Instruments  
of Carburetion

**DETROIT MICHIGAN**



Please mention The Automobile when writing to Advertisers

# PHILIPS



## IGNITION

### COMBINED IN ONE INSTRUMENT

*By a turn of a switch*

#### SINGLE SPARK SYSTEM

This new open circuit, single spark battery system is distinguished by many newly patented features that can be found in no other battery ignition system.

It is simple in construction and fool-proof.

All working parts are perfectly balanced. Inertia or mechanical lag has been practically eliminated, thereby insuring greater flexibility and responsiveness from the motor.

A new and greatly advanced form of contact maker produces a very hot spark for

starting and slow speeds and a constant and uniform spark for all running speeds.

At all speeds the spark is extremely intensive, making it possible and advisable to use a *leaner* mixture than is customary with other ignition systems.

The result is a considerable saving in fuel and an *increase in power*, for while a *lean* mixture is most difficult to ignite it is the most *powerful* when fired.

This new form of contact maker, because of its construction automatically eliminates

lag, both electrical or mechanical at all running speeds without the aid of a governor.

The system also possesses a new form of armoured condenser that is immune to "ageing" or ordinary deterioration and is water, moisture and heat proof.

The coil is of great capacity although remarkably compact in size.

The current consumption is almost negligible. A single set of dry cells will operate a four-cylinder motor for months.

*This system is a part of the PHILBRIN "DUPLEX" but it is made separately for those desiring a single system of ignition.*

Duplex Switch combining two systems and when desired two sources of current.



Run on either system you desire. There is always a second system in reserve—*absolute assurance against ignition failure.*

Each system has its own individual advantages. Either system can be used continuously. Neither system will wear out before your car.

Write for complete descriptive catalogue.

**JOBBERS—DEALERS**

Distributing arrangements are now being completed with the trade. Jobbers, Dealers and Service Stations write for particulars.

**PHILIPS-BRINTON**  
Weidener Bldg. Sales

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# LEX BRIN SYSTEMS

**TWO WONDERFUL IGNITION SYSTEMS**  
*either system can be used*

## HIGH FREQUENCY SYSTEM

This is a system that is especially designed to derive full maximum efficiency from the motor when the condition of the gasoline, or the motor itself, or the adjustment of the carburetor is such as to render efficient ignition difficult.

Such conditions include:

- Starting or running a cold motor,
- Low grade gasoline,
- Poor adjustment of the carburetor (frequently due to changes in the tem-

perature or altitude),  
Carbonized cylinders,  
Unusual up-hill grades.

Instead of a single spark this system distributes a "shower of sparks" of remarkable intensity to each cylinder in its firing order at the rate of a thousand sparks a second.

Almost any mixture under almost any conditions will give way before this system, so rapid is the "follow-up" of sparks and so high their temperature.

For starting in cold weather, for taking stiff uphill grades on high, for cleaning and keeping clean the spark plugs, for utilizing poor grades of fuel, this system is most invaluable to the motorist who insists upon full maximum efficiency under every possible conditions met in motoring.

This system, like the single-spark system, consumes almost negligible current and can be used continuously when desired.

*This system is a part of the PHILBRIN "DUPLEX" but it is made separately for those desiring a single system of ignition.*

Philbrin "Duplex" systems are built for 2-cylinder, 3-cylinder, 4-cylinder, 6-cylinder, 8-cylinder and 12-cylinder motors.

Philbrin systems can easily be installed in place of your present ignition system. No motor changes necessary.

Only one set of spark plugs necessary. Smaller in size than the average single ignition system.



Six-cylinder contact maker and distributor

CO., Kennett Square, Penna.  
Office Philadelphia, Pa.

Please mention The Automobile when writing to Advertisers

# SCHATZ

**High Radial  
Thrust Capacity**

**Schatz, Quality**



**T**HE SCHATZ "Universal" Annular Ball Bearing will sustain thrust loads up to 50% of its rated radial capacity, in either direction without adjustments of any kind. This advantage over other ball bearings is due to the SCHATZ three-point contact.

The three-point contact is secured by the substitution for the conventional raceway, of two separate race rings or cups. Definitely located contact points on a given angle in the double race rings secure a maximum thrust resistance.

The SCHATZ Triple Contact not only increases the thrust load capacity of the SCHATZ bearing over other bearings, but together with the careful, accurate workmanship and maximum number of balls, permits of a greater radial capacity for the size of the balls and reduces likelihood of breakage.

In materials, workmanship and design, manufacturers will find the SCHATZ bearing the best adapted for use in automobiles.

Write us for information, estimates on requirements and time. Our equipment permits exceptionally prompt deliveries.

**THE FEDERAL BEARINGS  
CO., Inc.**

Succeeding The Schatz Mfg. Co. in the manufacture of the Schatz Universal Annular Ball Bearing.

**POUGHKEEPSIE, N. Y.**

9

Please mention The Automobile when writing to Advertisers

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*The sign of  
a revolution  
in standard  
methods of  
power  
application*

---



**N**OW skidding and stalling, car-swaying and wheel-spinning, tire-scuffing and loss of power—dangerous and expensive for owner and driver of car, truck or tractor; baffling problems for motor engineers—all are eliminated at one stroke by the simple, positive, invariably-efficient

# B A I L E Y

*Non-Skid—Non-Stall*

# D I F F E R E N T I A L



# Do You Know of Skidding, Swaying,

## Why a Differential Is Necessary

The rear axle of an automobile is divided in the middle and equipped with a *differential* to allow the rear wheels—which drive the car—to run at *different* speeds.

In turning corners the outside wheel must *outrun* the other. If there were no differential, one wheel would have to slide on each turn and tires would grind to pieces.

But the conventional *gear* differential—the kind that has been in common use since the first automobile was invented—gets its action through a principle which is useful only part of the time and *wasteful*—or *dangerous*—at other times.

*It operates by throwing the power to the wheel which offers least road resistance.*

In other words, it gives the power to the wheel that can't use it.

This allows the free play necessary for turning corners but it also is the cause of nearly all accidents by *skidding*, all *spinning of wheels*—with consequent loss of power and *scuffing of tires*. It causes *side-sway of the car while running at high speed*, and *practically all stalled-in-the-mud dilemmas*.

## Habit Has Made These Evils Seem Inevitable

Yet the gear differential, because there was no better device, has been in use so long that the motor-using public has come to look upon spinning, skidding, stalling, etc., as *necessary evils*.

In fact, the public has become so used to the gear differential that few, besides engineers and manufacturers, know the real reason for these dangerous and expensive driving faults.

## You Can Prove the Inefficiency of this Principle

One simple experiment shows where the blame lies.

Jack up the rear of your car and start the engine. You can stop either wheel with your hand and the other goes twice as fast as before.

The wheel you took hold of offered

*more resistance* than the other and so *lost its power*.

This shows what happens when, in driving, one wheel strikes a slippery spot—ice, snow, grass, sand, mud or wet pavement. Immediately that wheel offers less resistance than the other and so the gear differential *automatically* gives it all the power. Then it spins and pulls the rear of the car out of line.

## Why You Stick in the Mud

Should you happen to drive one wheel into deep mud—and have not enough momentum to carry you through by sheer weight—the wheel in the mud gets all the power and you stick there. The spinning wheel churns the puddle and digs itself in deeper and deeper—like a buzz-saw going into a log. The wheel on good ground has no power and so can't pull you out. *You are stuck*.

In difficult going the whole tendency of the gear differential is not only to pull you into the gutter but to keep you from getting out after you are there.

And this is only the spectacular side of the shortcomings of the old-style differential. It's tendency to throw the power to the wheel which can't use it causes a constant waste of fuel. Experts estimate this waste at 15%, in average going—slightly less in summer and much more in winter.

## Great Waste of Tires

The tire waste, charged properly to the common differential, is vastly more important.

It has been shown that the Bailey gives car and truck owners at least 35 per cent greater tire mileage.

## George D. Bailey Solved the Problem

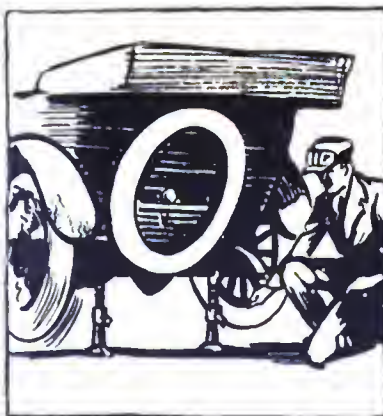
Engineers have known all along that the differential problem would be solved some day. And it was solved, properly and finally, three years ago, by George D. Bailey.

Before a single Bailey Differential was sold to the public, the device was given a solid year of grueling tests.

Then it was put on the market, quietly, two years ago.



For turning corners and to allow for road inequalities a differential is essential.



With the ordinary differential as soon as you stop one wheel the other gets twice as much power as before.

# the Real Cause Spinning, Stalling?

## **The Bailey Eliminates Traction Troubles**

Now 12,000 Baileys, sold practically without advertising and without sales effort—sold purely and simply on the wonderful merits of the device—have been put into service and have proved the worth of the simple, revolutionary principle on which they are built.

Since then changes and refinements have been made until today the improved Bailey Differential—brought to a state of positive perfection, tested and proved by months of the most strenuous tests—is announced to the motor car, motor truck and tractor industries—and to the public.

The improved Bailey Differential has only one thing in common with the conventional gear type: It enables the outside wheel to go faster than the other when the car is turning a corner.

In everything else it is an exact opposite.

*The result is that stalling, spinning, skidding, swaying, power-wasting and tire scuffing are practically unknown in a Bailey-driven motor car or truck.*

All the power goes automatically to the wheel that has traction and so has use for power.

## **This Shows How It Works**

It's the same principle you use in walking.

When one foot strikes a slippery spot, your weight—your power—instantly, and without thought, is transferred to the other foot.

When one wheel strikes a slippery spot, the power, instantly and automatically is transferred by the Bailey Differential to the other wheel.

When one wheel gets in a mud hole, the other wheel, on good ground, gets all the power—and you go *right on out*.

When one wheel bounds from the ground it does not spin, so there is no

scuffing of the tire, or straining of driving parts, when it hits the ground again.

When you round a corner the *inside* wheel has all the power—another anti-skidding effect.

The Bailey has no gears and does not depend on friction. It works on the simple pawl-and-ratchet principle—as old as the science of mechanics, and as positive in its action as the thrust of a piston.

For more than two years the Bailey has had the test of varied use. Twelve thousand Bailey-driven cars have given their owners an utterly new conception of driving safety, comfort, power and economy.

Now, in its final, perfected form, the improved Bailey Differential is coming into its own.

## **Users' Experience a Wonderful Revelation**

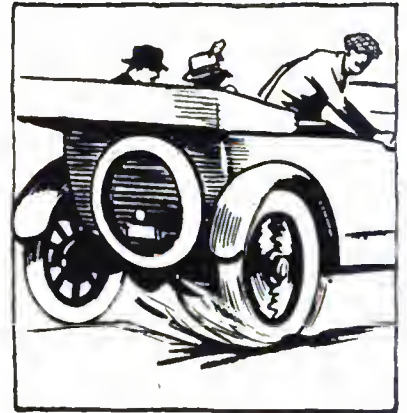
Wherever wheels can turn Bailey owners drive their cars. They seldom think of the going at all. High-crowned clay roads, slick with a pouring rain, hold no terrors for them. *Without* chains they go through mud-swamped roads, through heavy drifts of snow, where other cars, *with* chains, can not go. Their gas bills automatically decline. Their tires last much longer. They feel safe all the time.

These are strong statements but we have the evidence.

**Now the improved Bailey Differential is sold on a basis of money-back-without-question in 30 days.**

We run no risk on this guarantee. No motorist or truck owner would ever consider driving a car or truck with the ordinary differential once he has used the Bailey.

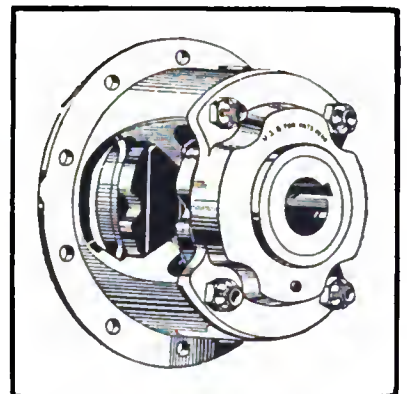
Twelve thousand are in use now—sold practically without advertising or sales effort—by sheer weight of merit—by word of mouth from one enthusiastic user to another.



*With the ordinary differential the wheel in the puddle gets all the power so the other can't pull you out. The Bailey reverses this—puts all the power into the wheel that can use it.*



*When one foot has no traction the other, properly, gets all your weight and power. In the same way the Bailey throws the power to the wheel that is on good ground and can use it.*



*This shows the simple, strong construction of the Bailey Differential.*

(Continued on next page)

# Vigorous Merchandising for the Bailey Differential

*The Bailey—surrounded by a Chinese wall of patents in all civilized countries—has proved itself in actual service—in thousands of instances, in practically all parts of the world.*

Now the *improved* Bailey will be sold on the scale it deserves.

Strong financial interests and engineers respected by the whole of motor-dom now are back of the device.

The things it does are so revolutionary—its work is so important for every man who makes or sells, owns or drives a car, truck or tractor—that it is already getting *national* attention.

A bare statement of its virtues—such as that on the preceding pages—makes people want it. A demonstration, in actual use, sells it to every interested and open-minded person.

## Big Replacement Business Sure to Come

There is a tremendous replacement business waiting for this *logical* differential, and we have arranged to market the device on terms that are satisfactory to the consumer, and which offer handsome margins to the established channels of trade.

Sales of the Bailey will be backed by a comprehensive and spectacular advertising campaign—a campaign in thorough keeping with the revolutionary character and importance of the device.

And remember 12,000 have been sold already—with practically no advertising or sales effort.

This is because it is not an article to be *tacked on* to a car for mere convenience, but which gets right down to the *vitals* of the machine and gives it *life, stability* and *road efficiency* which were not possible before and which cannot possibly be attained in any other way.

Any man, familiar with motor cars, and knowing these facts, must know, also, that there is bound to be a tremendous—*universal*—demand for the Bailey, for changeover purposes.

## Do You Want a Share in This Business?

And we are looking for a few men who are anxious to go along with us on this business. We need distributors in several

important sections. Already, as a result of our preliminary "blind" advertising in the trade papers, the news of the Bailey has leaked out and we have applicants for more territory than we have left.

But we want the best distributor possible to secure in each center. We want distributors with capital and ability to handle a "big deal"—for the distribution of the Bailey is bound to be a tremendous thing.

We ask such men to investigate our product, our plans and our standing, and to give us the opportunity to examine their qualifications.

## This Opportunity Will Not Be Open Long

We suggest writing or wiring at once for details and terms, with the understanding that no contract can be made until after a personal interview.

Dealers, jobbers, garagemen and repair men should order the Bailey direct from us immediately.

We have ready, in stock, differentials for Fords, Overlands and Chevrolet 490's, constituting a very large part of the cars now in use. Differentials for other types of cars will be on the market soon.

### PRICES

Improved Bailey Differential for Ford cars—equipped with ball thrust bearing ..... \$25.00

Improved Bailey Differential for Chevrolet 490's—equipped with ball thrust bearing..... 25.00

Improved Bailey Differential for Overland cars, models 38, 45, 46, 49, 49V, 50, 51, 58R, 59C, 59R, 59T, 79B, 79RC, 79T, 80C, 80R, 80T, 81T, 81R, 83T and 83R.... 30.00

The Bailey is a money-maker. Those who get in now—*on the ground floor*—will profit accordingly. Use the coupon.

# \$1000 FOR SENSIBLE LETTERS

We offer \$1,000, in seven prizes, for the most sensible letters written about the Bailey Differential and received by us before April 1.

First prize will be \$500; second prize \$250; third, fourth, fifth, sixth and seventh prizes, each \$50. All prizes cash.

Any man, woman or child may compete, except those who are connected in any way with the Bailey Non-Stall Differential Corporation, with the agency which prepares the Bailey advertising, or with the publications in which that advertising is placed.

The letters must not contain more than 300 words.

They must be written about the advantages of using an automobile, truck or tractor equipped with the Bailey Differential. Arguments for the letters may be derived from personal experience or

from the statements in our booklets or advertisements.

This is not a letter-writing contest in the usual sense of the term. Beauty or neatness of expression or writing will have nothing to do with the award. Decision will be made on a basis of *sense* and that alone.

Our request to the judges is merely that they award the seven prizes, in order, to the writers of the seven most *sensible* letters about the advantages of the Bailey Differential. The judges will interpret for themselves the meaning of the word "sensible."

Members of the Contest Board of the A. A. A. will pass upon the letters and award the prizes.

**BAILEY NON-STALL DIFFERENTIAL CORPORATION**  
Dept. N-8  
1124 Michigan Avenue Chicago

BAILEY NON-STALL DIFFERENTIAL CORPORATION,  
Dept. N-8 1124 Michigan Ave., Chicago.

Please send me description of the Bailey Differential, also prices and terms on which it is sold. I am a (check which)

Car owner \_\_\_\_\_, Garage owner \_\_\_\_\_, Repair Shop owner \_\_\_\_\_,  
Jobber \_\_\_\_\_, Dealer \_\_\_\_\_, Distributor \_\_\_\_\_

Name.....

Address.....



**I'll End Your Spring Breakage**

**-Says No-Worry-Springs**

Same as I did those of Mr. Campbell. Here's his letter. It tells its own story:

I left Ecorse, Mich., two weeks ago in my Studebaker touring car with my family for Florida. I have made this same trip regularly for three years and have always experienced serious spring trouble. In fact, last year was forced to stop seven times en route to make spring replacements. Just before starting on the present trip I decided to try Tuthill "Titanic" Springs and equipped my car front and rear with them. I arrived in Tampa in two weeks from the time I left home and my springs are as sound as the day they were placed in the car.

Tuthill Titanic Springs will end your spring worries for all time. They don't break, because break-proof at the point where 3 out of 4 springs break. Next time a spring breaks, get a Tuthill Titanic. Most dealers carry them. Any dealer can get them for you within 24 hours.

**Write for new booklet**—"Your car is no stronger—no safer—than its springs." Free on request.

**3 out of 4 spring breaks are at the center**

**TUTHILL**

*Lubricated*

**TITANIC SPRINGS**

are

**guaranteed forever**

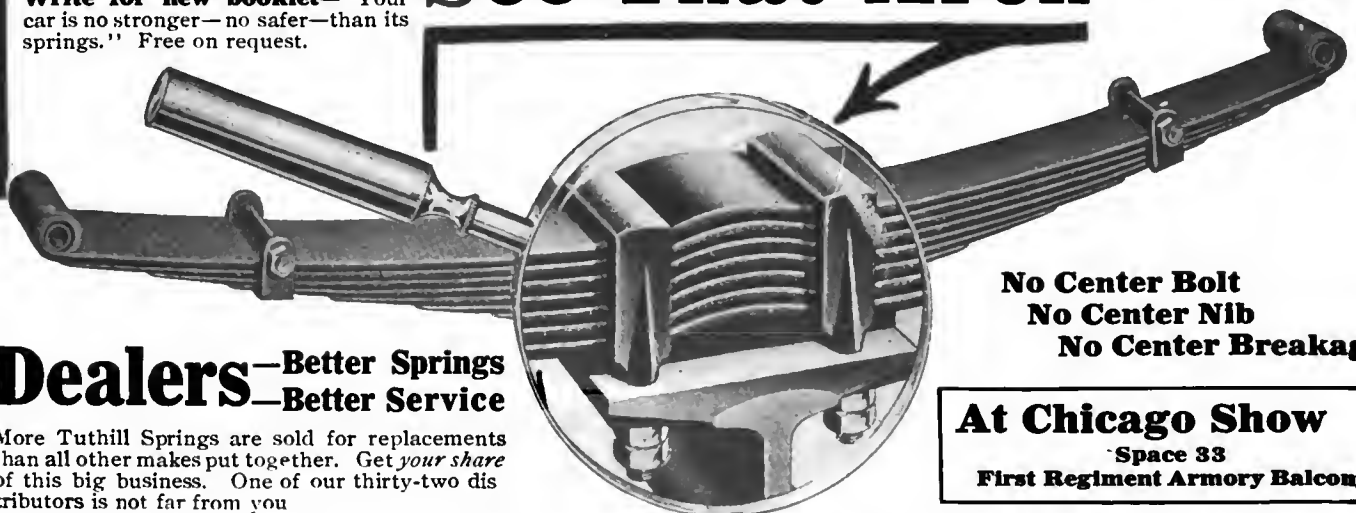
**against center breakage**

**No Increase In Prices**

**TUTHILL SPRING CO.**

**760 Polk Street, Chicago, Ill.**

**See That Arch**



**No Center Bolt  
No Center Nib  
No Center Breakage**

**At Chicago Show**

**Space 33  
First Regiment Armory Balcony**

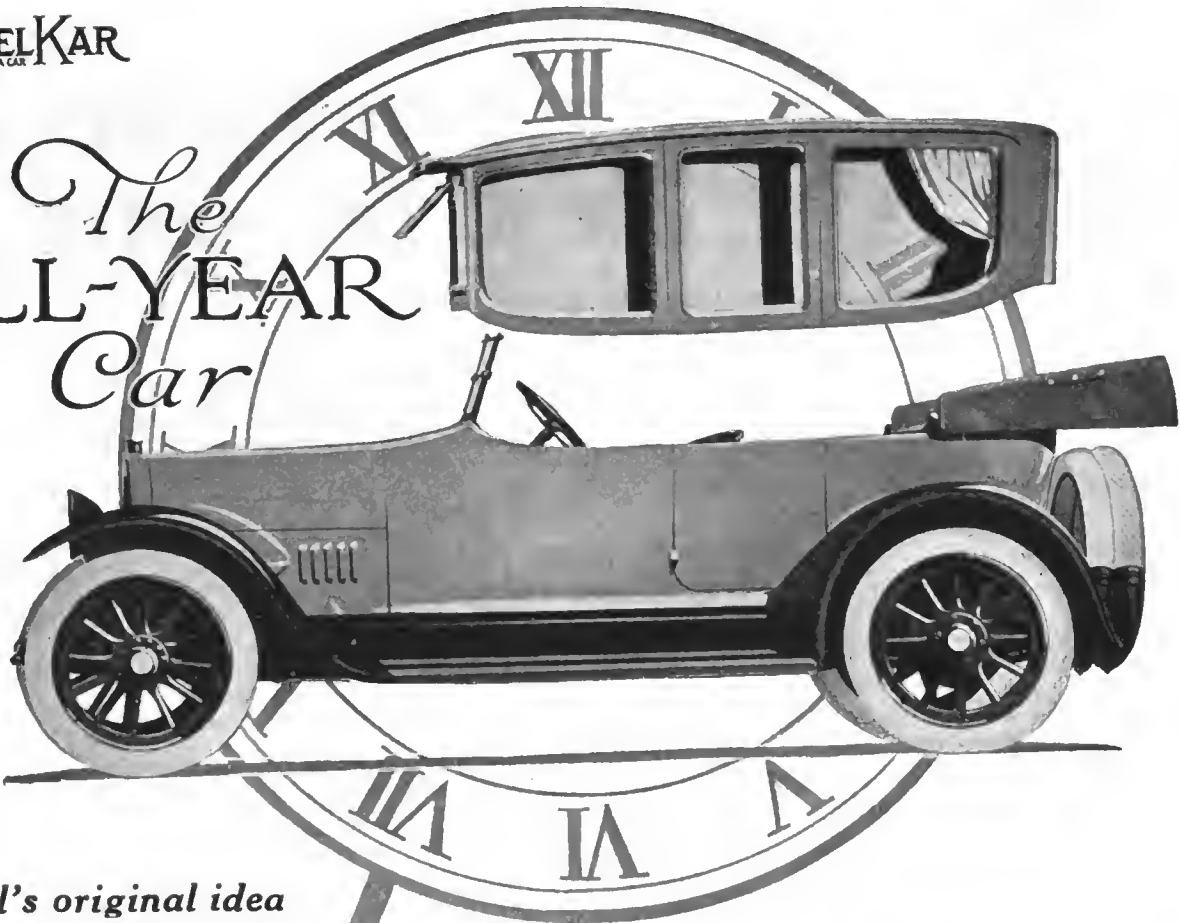
**Dealers—Better Springs  
—Better Service**

More Tuthill Springs are sold for replacements than all other makes put together. Get your share of this big business. One of our thirty-two distributors is not far from you

Please mention The Automobile when writing to Advertisers

**KISSELKAR**  
EVERY INCH A CAR

The  
**ALL-YEAR**  
Car



*Kissel's original idea that changed the motoring habits of a nation.*

KisselKars will be displayed at all the important automobile shows.

## The Car for All Purposes in All Seasons and All Weather

For every social function or business use the ALL-YEAR Car is supreme 365 days in the year.

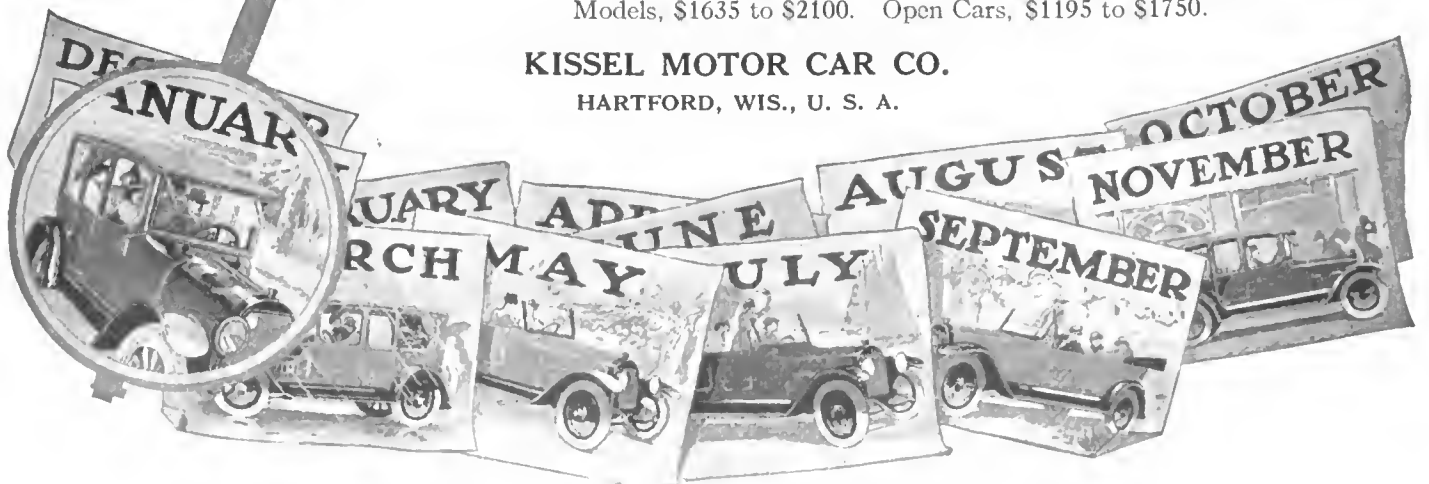
The ALL-YEAR Top is BUILT-IN, not on. It is *completely removable*.

See the ALL-YEAR Cars at the Chicago Show, Coliseum, that created big enthusiasm among New York's critical car buyers

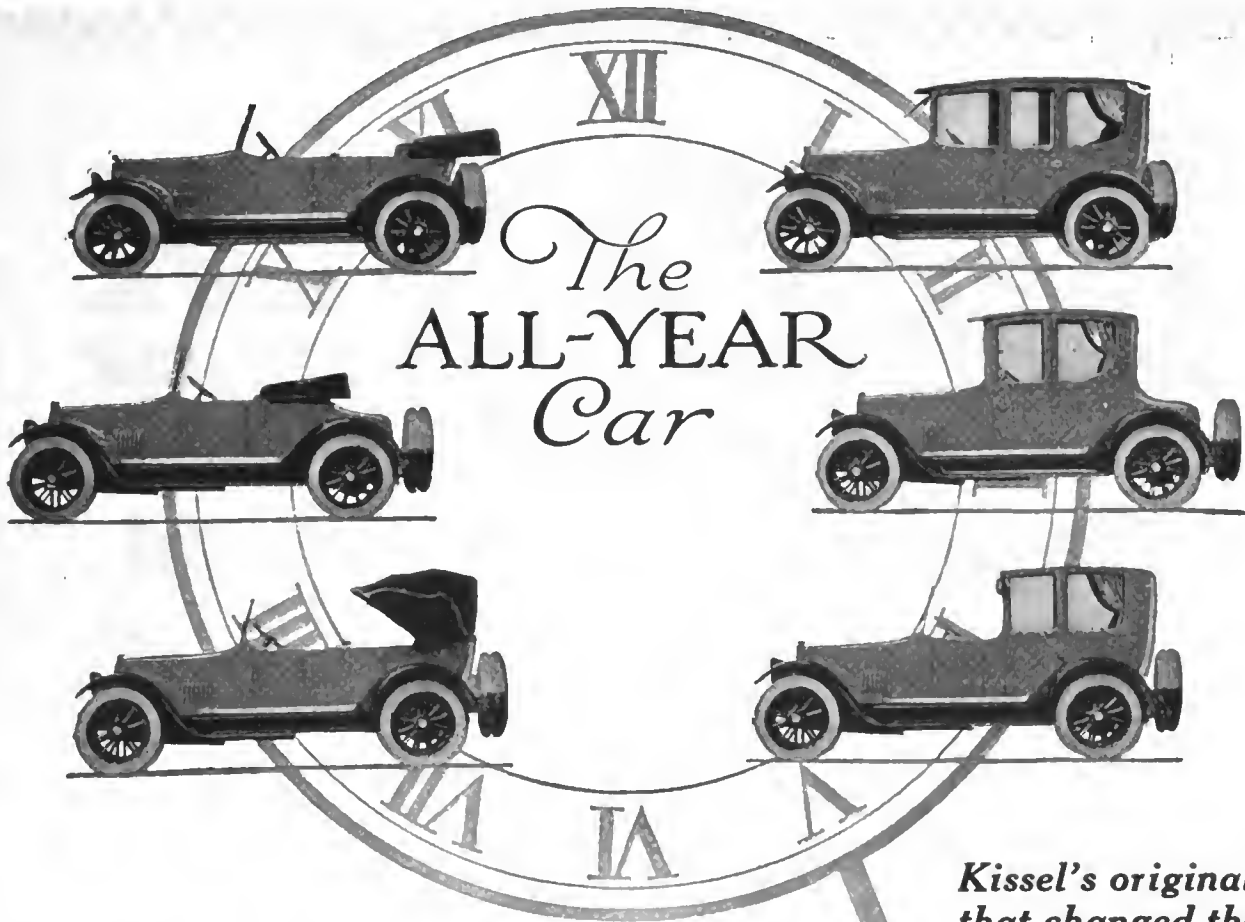
Inspect the HUNDRED POINT SIX—the car of a Hundred Quality Features. Prices f. o. b. factory. ALL-YEAR Models, \$1635 to \$2100. Open Cars, \$1195 to \$1750.

**KISSEL MOTOR CAR CO.**

HARTFORD, WIS., U. S. A.



Please mention The Automobile when writing to Advertisers



## Dealers: Cash In on America's Verdict of the All-Year Cars

"Kissel is supreme in his ALL-YEAR Idea" insures all-year-round selling activities for the KisselKar agency in your city.

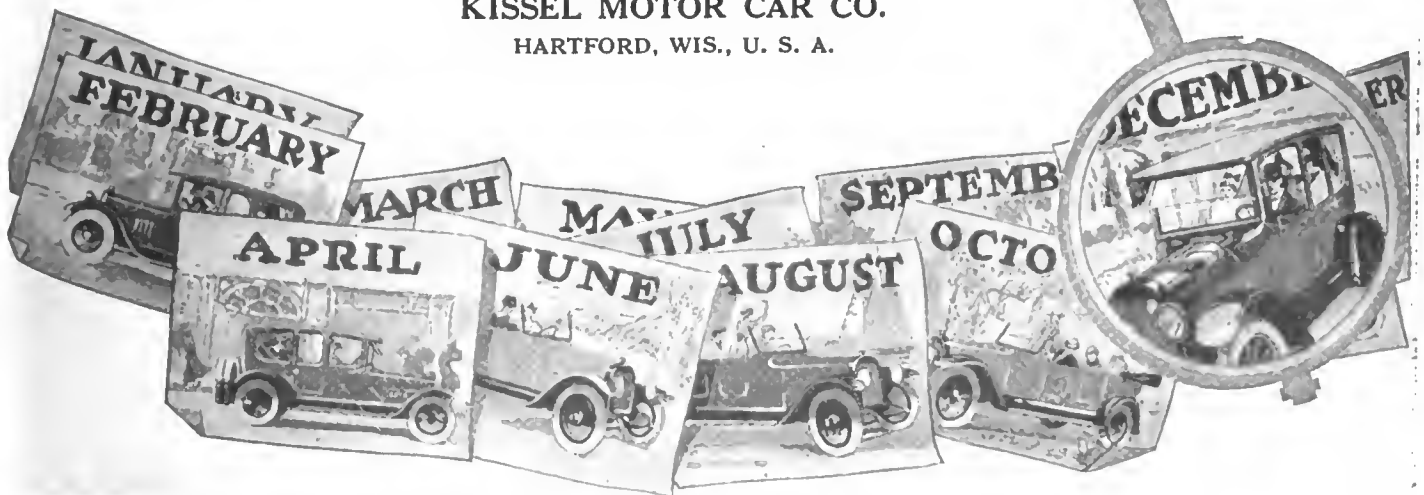
Inspect the ALL-YEAR Cars at the Chicago Auto Show and learn why their demand fills a 365-day-selling program.

Talk with our factory men at the Chicago Show, or write us regarding the agency for Kissel's ALL-YEAR Car in your city.

**KISSEL MOTOR CAR CO.**  
HARTFORD, WIS., U. S. A.

*Kissel's original idea that changed the motoring habits of a nation.*

See the KisselKars at all the important automobile shows.



Please mention The Automobile when writing to Advertisers

# Elgin Six

## "The Car of the Hour" Breaks Another Record

The Elgin Six has just established a new record of 67½ hours between Chicago and Miami, Florida.

Thirteen hours of this time was driven in a heavy rainstorm that made the roads slippery and dangerous, and in some places so deep and heavy with mud that the average car could not negotiate them at all.

The route included the steep, rocky mountain grades of Kentucky and Tennessee, the heavy sands of Georgia and the slimy, treacherous, swamp roads of Florida.

*The Elgin Six has made perfect scores and won highest economy honors in some of the most gruelling endurance and economy runs of the past year.*

Many other remarkable Elgin performances have firmly established the Elgin Six as *A Mechanical Masterpiece*, and a champion for long sustained speed, endurance and economy.

### Special Elgin Features

The Elgin Six is the only car in its price class having the fashionable center cowl of the high priced European models. Its beautiful yacht line design was established by a famous artist and gives the Elgin Six a style and distinction that sets it apart from the monotonous design of the average car.

Elgin Engineers have perfected an improved rear spring suspension, found only in the New Elgin Six, which sets a new standard of motoring ease and comfort at high speeds, reducing shock and vibration to a point not surpassed in any car at any price.

The special construction of the Elgin velvet-acting clutch enables the Elgin Six to be started on high gear, under ordinary conditions, eliminating to a large degree the necessity of gear shifting, *thus removing the last barrier to the safe and easy handling of a motor car by women.*

5-Passenger Touring **\$985**  
4-Passenger Roadster

The completion of our big, modern, daylight Plant No. 2 has so increased our production that we are now entering new territory. Yours may be open.

Better wire us today for application blank and full particulars of 1917's best money-making proposition for dealers.

**Elgin Motor Car Corporation, Chicago, U. S. A.**



*The OTIS ELEVATOR COMPANY announces that*

Otis Worm Drive Axles and Electric Steel Wheels will be exhibited at the forthcoming Chicago Automobile Show, where truck manufacturers, dealers and users will have excellent opportunity to study and inspect these latest developments in worm drive axles and steel wheels.

Otis Worm Drive Axles will be found to be of most advanced design, embodying many refinements, and both Axles and Wheels of high-grade workmanship and structural quality throughout.

Exhibited on Second Floor, Rear of  
Coliseum Annex, Chicago.

Please address all inquiries to Industrial Department

**OTIS ELEVATOR COMPANY**  
Eleventh Ave. and Twenty-Sixth St., NEW YORK



# The EMERSON

## \$395



## AN ECONOMICAL CAR

That is at the same time Comfortable,  
Good Looking, and Soundly Constructed

THE EMERSON FOUR does not resemble a Roman Chariot. It is not bedecked with purple and gold. Neither is it a 90-horsepower "road-burner." It is not intended to rival the large, expensive automobiles.

IT IS A SENSIBLE CAR for the sensible man, who desires to stay within his means and at the same time enjoy the pleasures of motoring.

IT IS A SIMPLE, SAFE CAR, that your wife or daughter can drive easily and confidently.

IT IS A COMFORTABLE CAR, with plenty

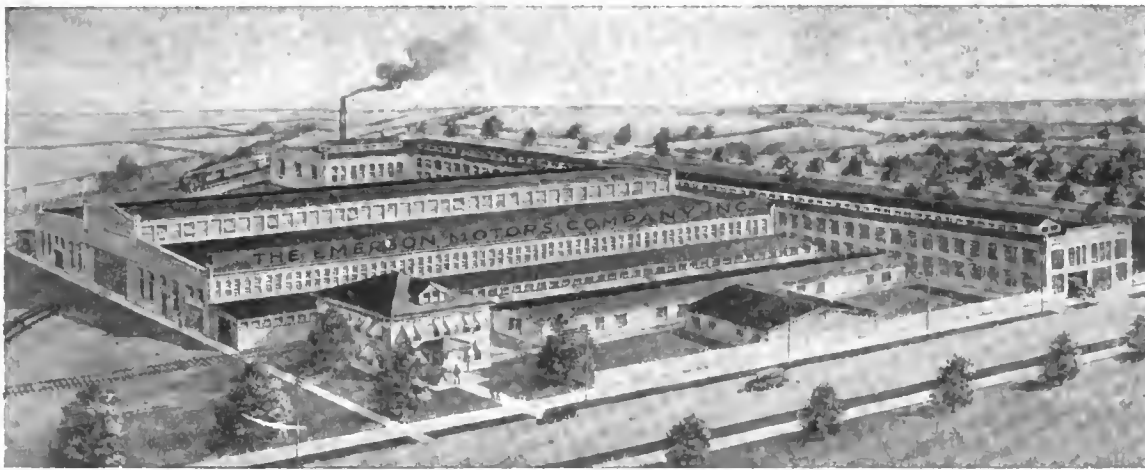
of leg room, with efficient springs and sufficient length of wheelbase. It enables you to "tour" without tiring yourself and passengers, or alighting with stiff, cramped limbs at the end of the journey.

IT IS A GOOD-LOOKING CAR, low-hung, stream-line, handsomely finished and equipped.

IT POSSESSES THOSE DESIRABLE QUALITIES of graceful lines, exceptional roominess, ease of riding, and plenty of power with economy.

# EMERSON FOUR

*The Lowest-Priced*  
**5-Passenger 110-inch Wheelbase**  
**Car in the World**



## DEALERS

The Emerson Four is going to be one of the largest and fastest sellers of the coming year. It fills a gap just where the demand is heaviest. We are making dealer contracts now, and we want you if you are a live, dependable dealer. There is no car that you can take on with more complete confidence of good, permanent profits. If you are interested, we should like to hear from you as soon as possible.

**THE EMERSON MOTORS  
 COMPANY, Inc.**  
 KINGSTON, N. Y.

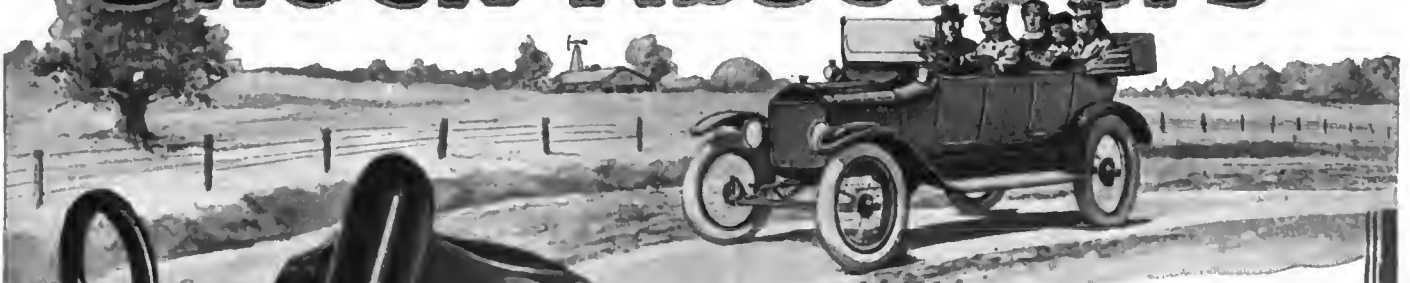


At the Chicago Show  
 The Emerson Four can  
 be seen at the Coliseum,  
 Basement Floor, Space  
 No. 16.

# AITCHANDEE

"TRADE-MARK REGISTERED"

## Shock Absorbers



### "Iron" the Road for Fords

THERE'S a surprise in store for you when you equip your Ford with H. & D. Shock Absorbers. The first bad road you strike you will look ahead, and when you see a bump you will brace yourself for the shock. You reach it—you pass it and all the shock you get is one of surprise because you hardly felt it. In a short time you relax—the old habit of anticipating shocks is gone—your enjoyment of riding is doubled and you are not tired after a long drive.

## AITCHANDEE Shock Absorbers

make Ford cars ride like the cars of longest wheel base and greatest weight. The reason is the cantilever principle, and the most important feature that the tension is different on the upward and downward thrust.

If the tension were the same, as on ordinary shock absorbers, the greater the resistance to the downward thrust, the greater would be the rebound.

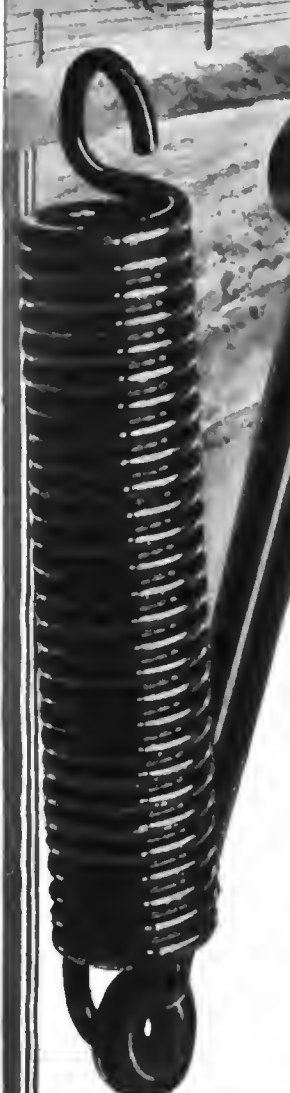
The Aitchandee practically holds the body still while the wheels and axles follow the contour of the road. Comfort is the main reason for equipping your car with these shock absorbers, but there are many secondary reasons, for ex-

ample: They make steering much easier on rough roads. They save wear and tear on engine and transmission.

They save tires by preventing side sway and pounding. Vibration, which loosens up bolts and screws, is eliminated, consequently rattles do not develop.

Easy to put on—no holes to bore. Do not mar the appearance of the car, for they are scarcely visible.

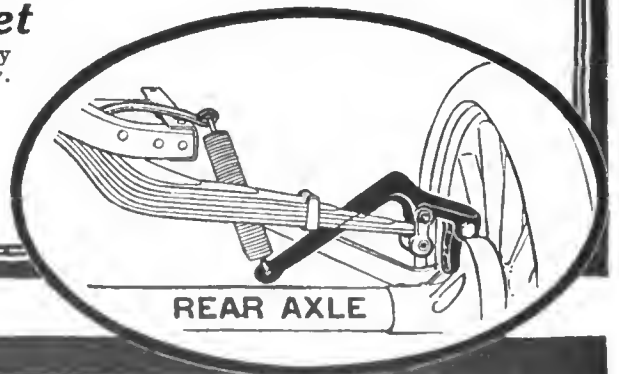
Guaranteed for the life of the car. \$10.00 per set of four. Your dealer will put them on while you wait.



If your dealer cannot supply you — **Write Us for Booklet** and we will see that you get your set promptly. Don't accept any but the Aitchandee. 100,000 sets ironing the roads for Fords today.

**H. & D. Company, Inc., Goodland, Ind.**

**DEALERS:** The Aitchandee Shock Absorber is right in structure, already tremendously popular, advertised nationally. It will rapidly build a profitable addition to your present business. Write us for proposition at once.



Please mention The Automobile when writing to Advertisers



**U.S.**  
**BALL BEARINGS**





# U.S. BALL BEARINGS

**I**T ISN'T ALONE the fact that the U S Ball Bearing factory is new and modern in every respect that has so much to do with the superior quality of U S Ball Bearings but also the fact that, being newly equipped, all the latest and most advanced manufacturing practices and equipment are in vogue.

¶ The ball bearing art has advanced greatly in the past few years and by planning and building to take advantage of all the more recent developments the U S Ball Bearing Mfg. Co. has been able to take advantage of every possible means and method of producing only bearings of the very highest quality.

¶ For it must be remembered that design and materials are fairly well established and the question of quality in a ball bearing—provided, of course, that the initial determination is to manufacture only a quality product—is largely one of care and precision in the manufacture of the product.

¶ This means first and fundamentally a physical equipment capable of turning out bearings manufactured within limits of a ten thousandth of an inch and then an inspection and checking system that will assure positive adherence to these limits.

¶ Such an equipment is that of the U S Ball Bearing Mfg. Co. Every known device and method looking to the realization of the highest ideal of bearing production will be found in this new and modern plant—



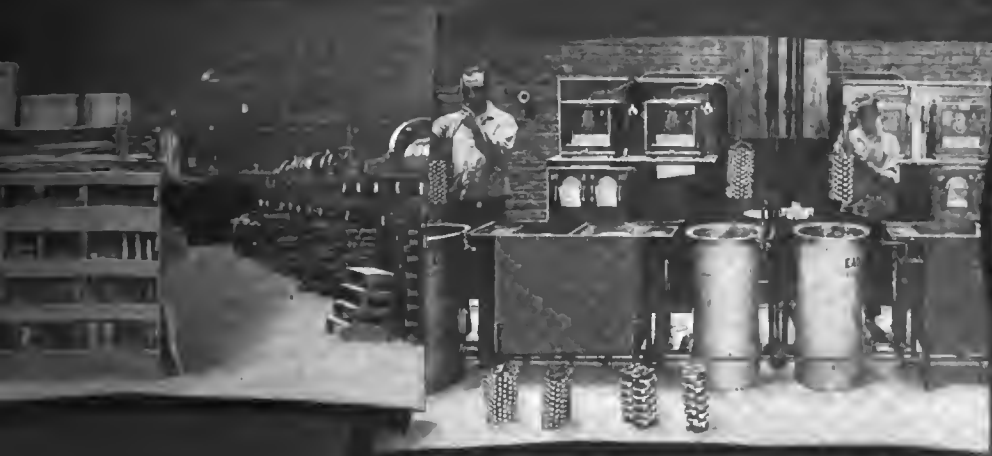
# U.S. BALL BEARINGS

so that we are able to say truthfully that every one of the bearings turned out of this 10,000-a-day factory is a quality bearing in all that the name implies.

While the physical plant is new, attention is called to the fact that the manufacturing organization itself is composed of experts in the bearing manufacturing art. In other words, the man equipment is a unit of workmen who are old in the business—men who for years have done little else than make quality bearings. In fact, many of our workmen have been with us for the seven odd years we have been developing the present U S Ball Bearing organization.

The illustrations on these two pages show various departments of this new factory—and together with the view of the entire factory on the last page give some idea of the size and immensity of the plant. And practically every bit of this vast amount of equipment is brand new—and designed along the lines of the most recent development in the art itself.

Given then, first, a determination to produce only the finest ball bearings possible of manufacture—a factory new and modern in every respect as to its physical equipment—a manufacturing organization composed of experts who have worked and co-operated each with the other over a long period of time—a manufacturing plan which insists upon the use of only the highest grade of materials and a most thorough checking and inspection both of materials and manufacturing operations—and it is easy to understand why every U S Ball Bearing is a quality bearing.

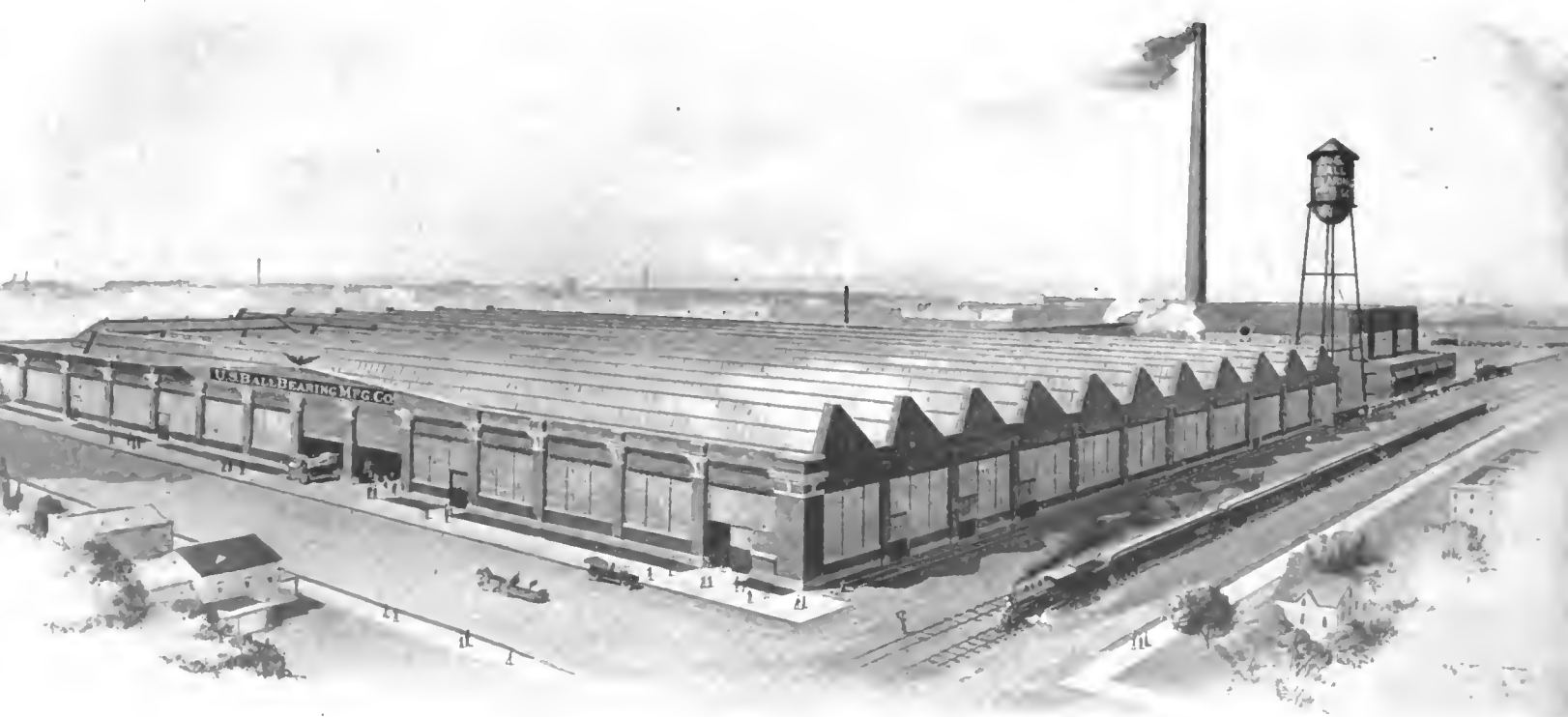


# U. S. BALL BEARINGS

VERY visitor at the Chicago show is cordially invited to inspect the U S Ball Bearing factory shown here-with—this modern plant with a capacity of 10,000 quality bearings a day. Chicago show headquarters are in the Congress Hotel (Auditorium Annex).

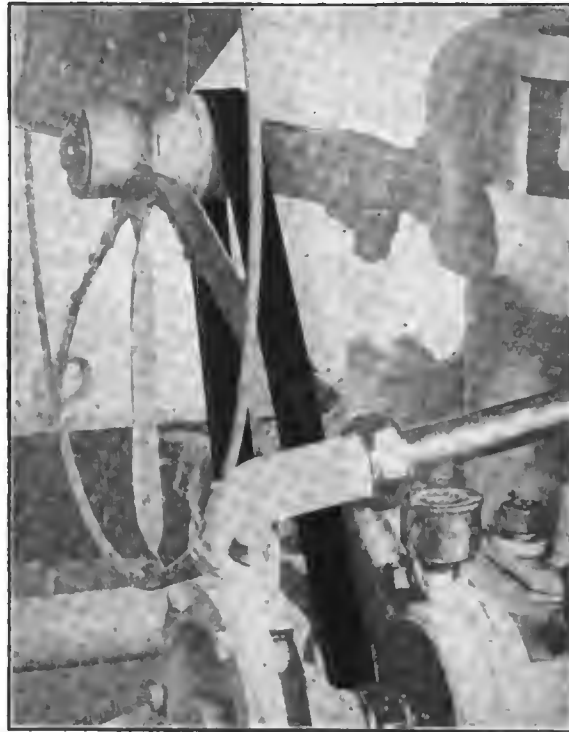
**U. S. Ball Bearing Mfg. Co.**  
(CONRAD PATENT LICENSEE)  
PALMER ST. AND KOLMAR AVENUE  
CHICAGO ILLINOIS

9



# Leather Parts that Deliver the Goods!

*Wetprufe*  
Fan Belts and  
Cone Clutch  
Facings.  
Solid and  
Laminated "V"  
Belts, "Flat"  
Fan Belting.



Generator  
Coupling  
Leathers,  
Universal  
Joint Boots,  
Knuckle Boots,  
Washers,  
Discs, etc.

ABOVE you see in action a famous *Wetprufe* Fan Belt—one of the many dependable leather automobile parts, (such as Cone Clutch Facings, Solid "V" and Flat Fan Belts, Generator Coupling Leathers, Universal Joint Boots, Knuckle Boots, Leather Washers, etc.) made by this company.

Practically 75% of all such leather parts used in the manufacture of automobiles today are of our manufacture.

The *Wetprufe* Fan Belt shown above is guaranteed to withstand water, heat and oil, and to give the best of service.

**Dealers!** Parts that have met for years the rigid tests of car makers are sure to satisfy your customers. Write for our profit-making proposition.

Write today for samples and prices of *Wetprufe* belts and other dependable leather parts.

## HIDE, LEATHER & BELTING CO.

227-B SOUTH MERIDIAN STREET, INDIANAPOLIS, IND.

Detroit Office: 408 Kerr Building.

W. C. DuComb, Jr., Special Representative

**WRITE** Ask us about LEATHERTEX—the new facing for cone clutches that is more resilient than all-leather, more durable than all-leather, more available than all-leather and *cheaper* than all-leather.

Please mention The Automobile when writing to Advertisers



# Electric Auto-Lite

STARTING - LIGHTING - IGNITION

## The Largeness and Smallness of Auto-Lite Service

¶ Each workman in our shops, each man in our offices, each clerk, each stenographer, each office boy, is thoroughly imbued with the Auto-Lite ideal—Service.

¶ Service is the most important word in our organization. It's the thing we hammer home the hardest.

¶ And we have the service spirit from president to janitor.

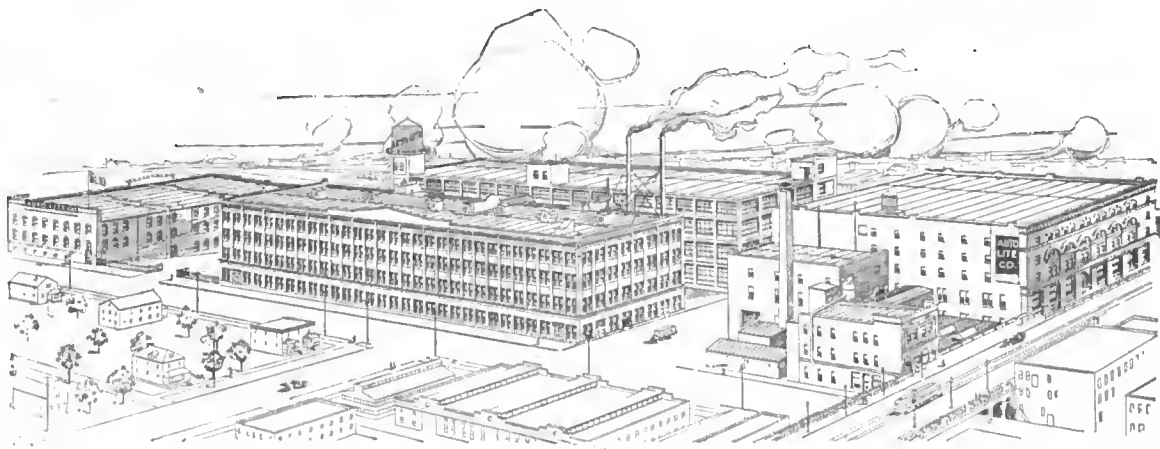
¶ Yet our department for rendering service is a small affair—manned by only a few workmen—occupying little space—never over busy.

¶ Such conditions in a business as huge as ours testify, more eloquently than anything else can, to the excellence of our product.

### The Electric Auto-Lite Co.

Head Office and Factory  
Toledo - - - - Ohio

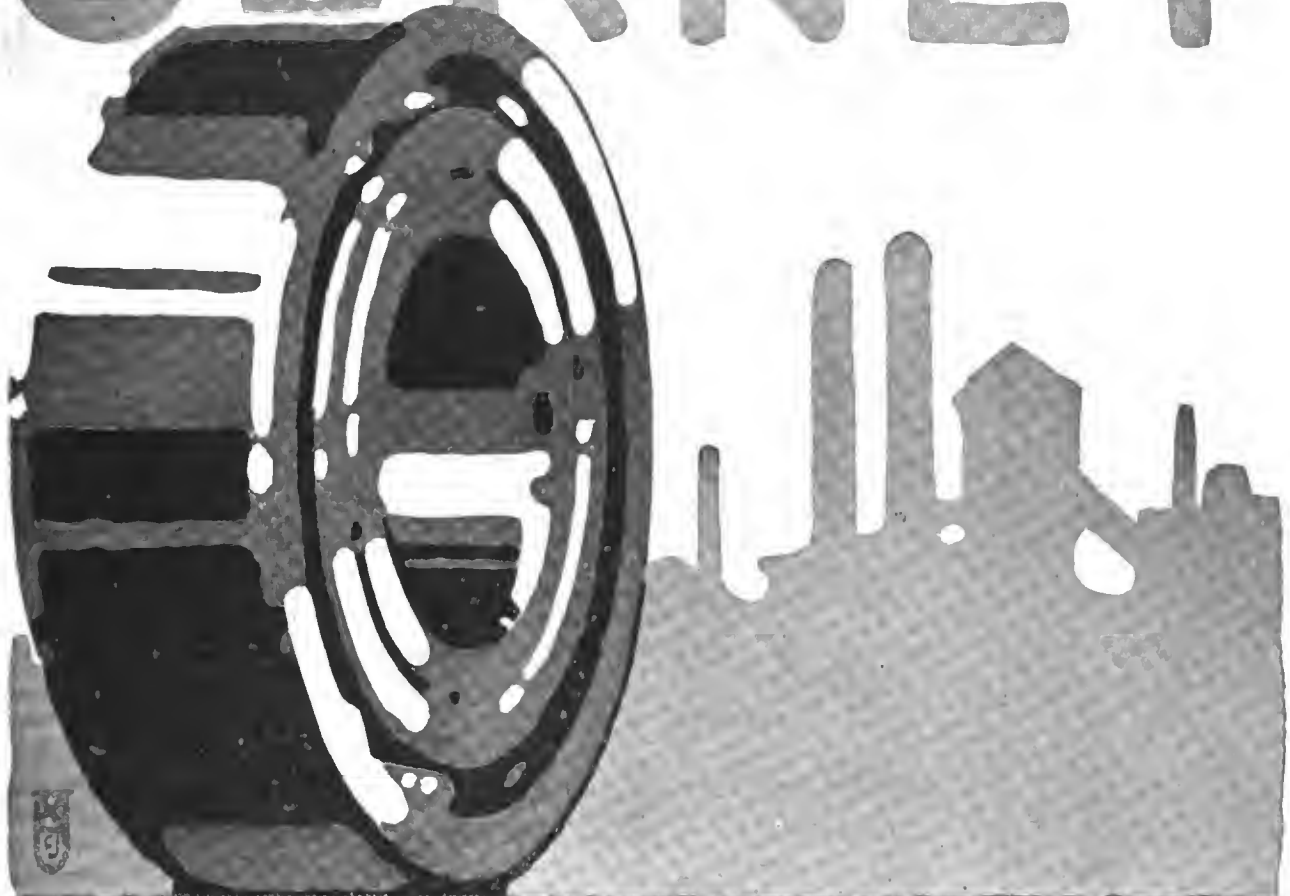
Detroit Sales Office  
1507 Kresge Bldg.



Home of the Electric Auto-Lite Company

These buildings, of the most modern construction, contain approximately 422,000 square feet of floor space. They are equipped with the most approved modern machinery and are turning out 1400 complete starting and lighting systems every day.

# GURNEY



**W**ILL the year just starting put upon our industries still greater demands for production?

Will it drive them to still greater output at any or all costs?

Or put an end to the times of plenty in an unprecedented avalanche of competition upon the markets of the world and force our factories to the employment of every known economic resource?

Be it the one or the other — output or economy — the answer in either case is the same —

Gurney Ball Bearings.

Gurney Ball Bearings for increased output.

Gurney Ball Bearings for greater economy

And this is true throughout the industrial world — whether applied to the factories themselves, or to their products.

Wherever friction is to be overcome, Gurney Ball Bearings offer the most efficient solution to the problem of its overcoming.

**GURNEY BALL BEARING COMPANY, Jamestown, N. Y.**  
 Chicago, Ill. Conrad Patent Licensee New York City



## A new "best seller" with no "backfire"

Once sold—stays sold. Delivers magnificent goods that never disappoint your customer. From price to pick-up, from magneto to mileage, a car of able, intrinsic worth—the new

# STANDARD

The Magneto  Equipped "Eight"

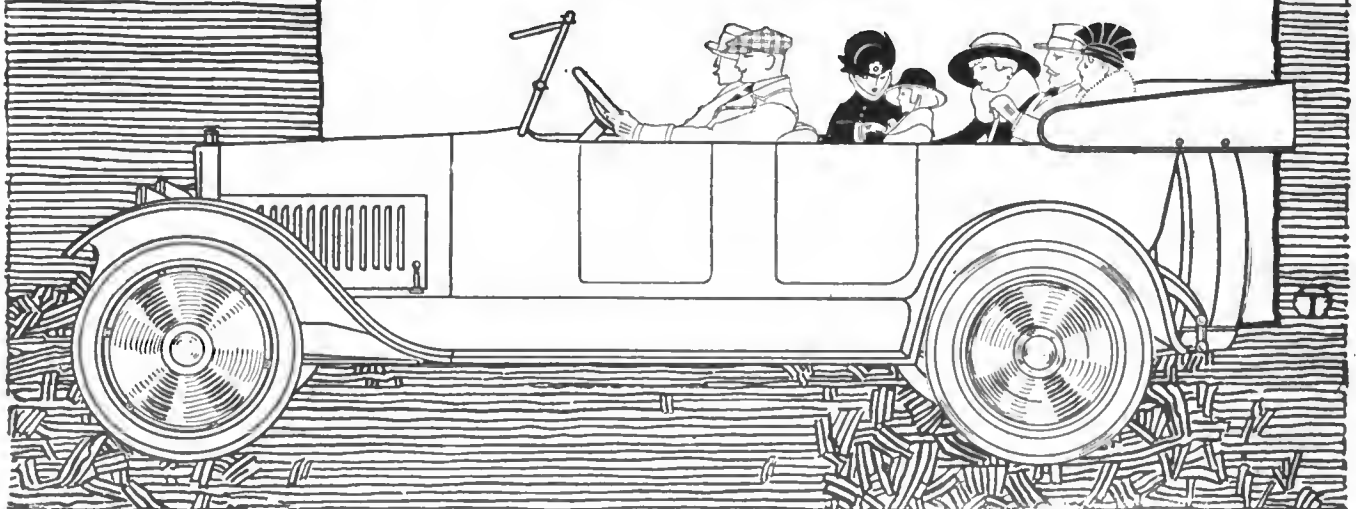
Profits and prestige for the dealer. This car outdemonstrates, outperforms, outclasses any "Eight" now in the field.

If you do not know the new Standard selling plan—if your present car gets a "backfire" from the buyer—send now for the Standard plan.

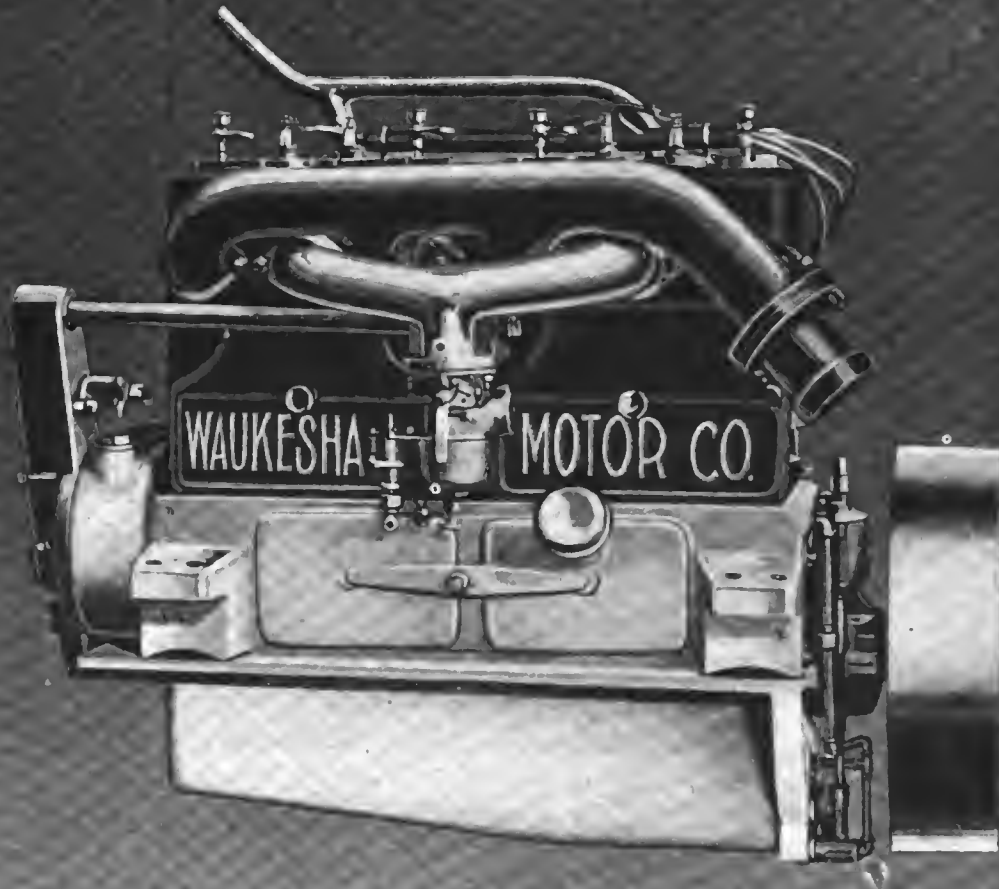
*80 H. P.—127 inch wheel base—7-Passenger Touring, \$2000.  
4-Passenger Clover Leaf Roadster, \$1950. F. O. B. Butler, Pa.*

**STANDARD STEEL CAR CO., Pittsburgh, Pa.**

*See Our Exhibits at the Automobile Shows*



Please mention The Automobile when writing to Advertisers



*Motors, like men, build fame on character.*

Character is built on high ideals, rigidly maintained. Unblemished reputation is the result—and reputation has created an unprecedented insistence for



## Four-Cylinder Motors for Tractors and Trucks

In deciding the power-plant problem for tractor or truck you can well permit the Waukesha policies, ideals and reputation to safeguard you in those details

which are not apparent on the surface. Such confidence will not be without its reward. Therefore, as a matter of protection to your tractor or truck investment,

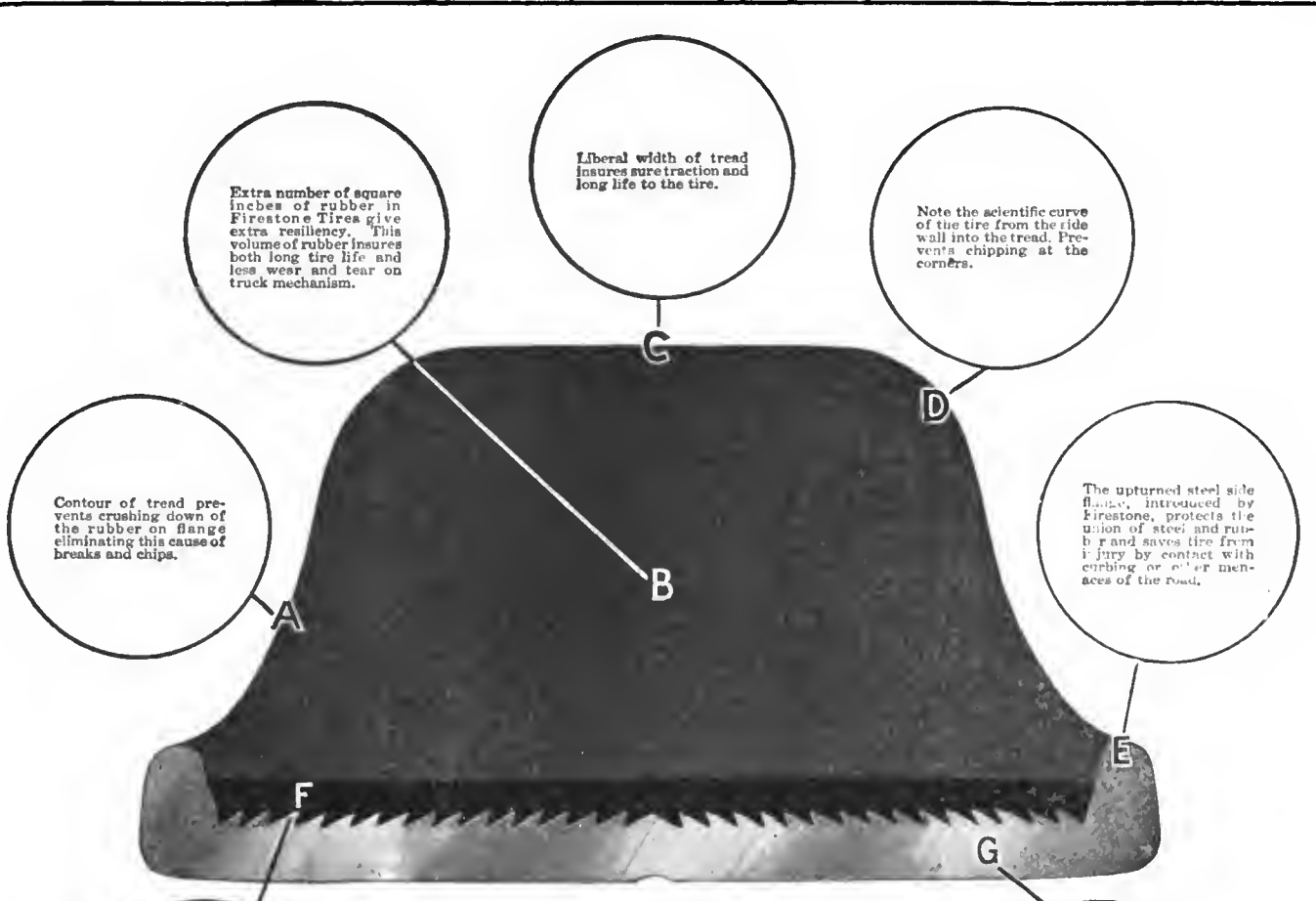
*"Demand a Waukesha Motor In the Tractor or Truck You Buy"*

Write for bulletin "A Guide to Tractor and Truck Buying"—and list of Tractors and Trucks that are Waukesha Motored. Tractor and Truck Manufacturers write for catalog.

See Exhibit at Chicago Automobile Show, January 27 to February 3

**WAUKESHA MOTOR CO.,** 207 FACTORY STREET **Waukesha, Wis.**

*World's Largest Builders of Tractor and Truck Motors Exclusively*



*Cross Section Pressed-on Truck Tire*

## An Inside View

**T**HIS section view of a pressed-on type of Firestone Truck Tire reveals the details of its construction. An inside view to enable you to form a more intimate and intelligent opinion of the merits of this type.

When pressed on to the wheel by means of an enormous hydraulic press, tire and wheel practically become a unit. Nothing can remove this tire except the same type of hydraulic press. An advantage of the pressed-on tire, aside from its grip on the wheel is its lighter weight.

Study the specifications, briefly outlined.

There is a Firestone Truck Tire for all roads, loads and conditions of service.

Will you make use of the services of one of our experts in the selection of your truck tire equipment?

**FIRESTONE TIRE AND RUBBER COMPANY**  
Akron, Ohio

Branches and Dealers Everywhere

# Firestone TRUCK TIRES



# Announcement

A one-ton truck unit—remarkably low price—quantity production—backed by a big factory and years of successful manufacturing experience. The only attachment including cab and body for \$350.00—an extra value and saving of \$75.00 to \$125.00.

The specifications insure quality and performance. They include Hess special heat-treated springs, solid forged axles, Bock roller bearings, Prudden wheels, hubs and rims, Kelly-Springfield tires, Cab and Body of the highest grade, thoroughly ironed and braced and receives seven coats of paint and varnish.

**Graham Brothers**  
**One Ton Ford Truck Unit**  
 Cab and Body included only → **\$350**

**Fully Guaranteed for ONE YEAR**

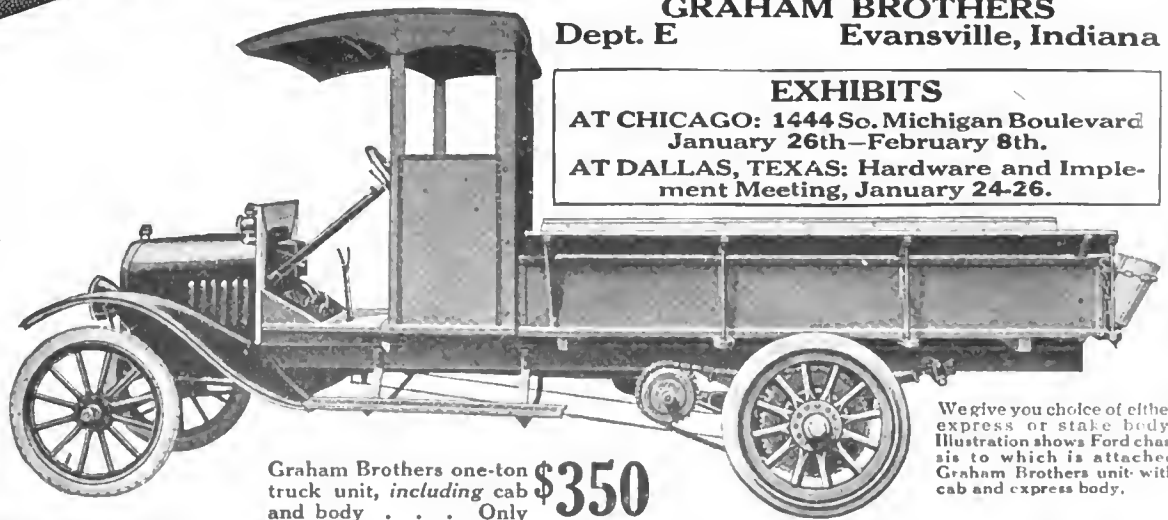
**GRAHAM BROTHERS**  
 Dept. E Evansville, Indiana

The tread on the rear wheels is standard—56 inches. There is no cutting off of the rear housing or change made in the Ford rear system. It is easily and quickly attached. No special tools are needed.

*Some territory still open for dealers. Write or wire.*

**GRAHAM BROTHERS**  
Dept. E Evansville, Indiana

**EXHIBITS**  
 AT CHICAGO: 1444 So. Michigan Boulevard  
 January 26th—February 8th.  
 AT DALLAS, TEXAS: Hardware and Implement Meeting, January 24-26.



Graham Brothers one-ton truck unit, including cab and body . . . Only **\$350**

We give you choice of either express or stake body. Illustration shows Ford chassis to which is attached Graham Brothers unit with cab and express body.



Please mention The Automobile when writing to Advertisers

# FAFNIIR

BALL BEARINGS

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Please mention The Automobile when writing to Advertisers

# The MONROE

MONROE



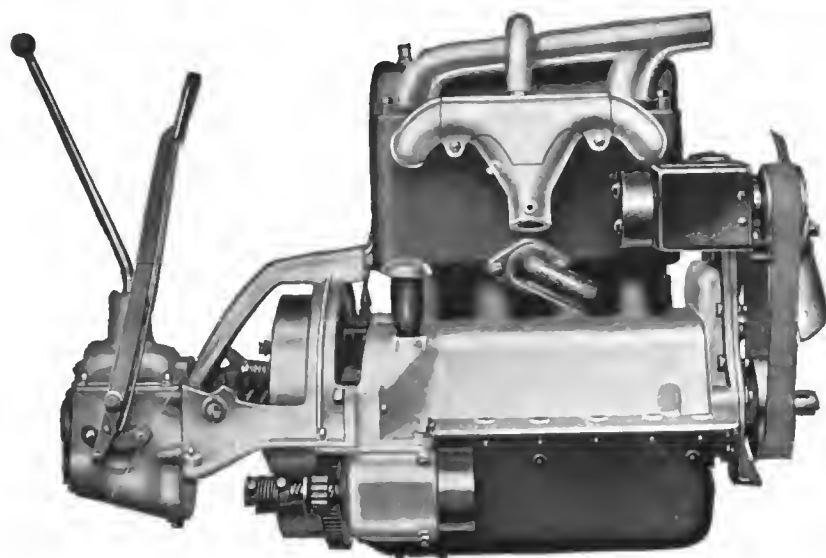
The Car That  
Convinces



\$985

Digitized by Google





### The Motor

A small, highly refined, highly developed 4-cylinder motor, valve-in-head type. The most efficient and convenient style motor ever built. With this motor the Monroe car will run at speeds from three miles per hour to sixty, quietly, without the slightest vibration and under perfect control.

The engine has removable cylinder heads, cast en bloc, a great convenience in handling, besides permitting extreme accuracy in grinding. The intake manifold is integral with this casting. The cylinders are also cast en bloc with the upper section of the crank case.

The crank shaft is larger than those used in the average motor of twice the size. The crank shaft bearings are 2 1-4 inches wide. The crank shaft is fully counterbalanced. The counterbalances are part of the original crank shaft forging. They are not welded or bolted on as is the case with every other counterbalanced crank shaft in use today.

The valves are large and easily adjusted. The cam shaft is hardened and ground. The Monroe car has a unit power plant.

### The Equipment

The Monroe power plant is supplemented by standard high grade units recognized throughout the industry as the best, and found on all high priced cars. On the Monroe you will find a Zenith

carburetor; Connecticut Ignition driven from the cam shaft, in combination with the belt driven Auto-Lite Generator; Auto-Lite Starting Motor with Bendix Drive operating on the fly-wheel; Fedders Radiator with thermo syphon cooling system and auxiliary tank; multiple disk type clutch using six dry plates of Raybestos and Steel; selective type sliding gear transmission, three speeds forward and reverse; nickel steel gears, double heat treated; Stewart-Warner vacuum feed. A Boyce Motometer gauges the condition of your engine. Ball Bearings are used throughout.

### Pressure Oil Feed

The special pressure oiling system of the Monroe solves the problem of over and under cylinder lubrication at high and low speeds in a very effective manner. The oil pressure is raised as the throttle opens, which causes the lubrication to increase as with power development and reducing it to a minimum when the engine is idling along with light loads.

The continuous circulation of oil through the crankshaft involved in the lubricating system of the Monroe carries off a considerable amount of heat, keeping the bearing temperature very near that of the oil in the oil pump. This also permits a thorough lubrication of the bearing with a minimum amount of oil as the heat which would otherwise be transmitted to the oil between the crankshaft bearings is carried off by the circulation.

*Can you Think of a single  
Not embodied in the—*

**MONROE**



### The Frame

The Monroe car is built upon the Brush patented chassis structure. The frame follows the lines of the body, permitting light construction with maximum strength; and a body as light as carrying requirements permit, giving at the same time a rigidity and stability unequalled in any other construction. The doors retain their alignment indefinitely and the rattling and squeaking of body parts is prevented. The Monroe car has the deep frame construction and compound cantilever springs which do so much to secure maximum riding comfort.

The lightness of the construction in body, chassis and motor economizes power and permits the use of moderate sized tires and reduces tire wear. The rear axle housing is pressed steel with nickel steel reinforcing tubes, spiral bevel gears are used to secure quiet transmission. Rear wheels are keyed directly to the outboard ends of the live axle shafts further lightening construction while increasing its reliability.

### The Locking Differential

In the rear axle the Monroe car has installed a M. & S. differential. This equal tractive differential is one of the most signifi-

cant engineering developments of the day. The man driving the Monroe car, equipped with a differential that operates only when necessary, is saved most of the danger of skidding and spinning. The reduction of spinning also reduces tire wear. In the Monroe car he is assured of balanced traction in both wheels under all conditions, an important asset when he is stuck and only one wheel has traction.

### The Body and Finish

The Monroe Car is as attractive in appearance as it is well built. It has neat, well balanced lines suggesting refinement and strength. The upholstery and finish are of the finest grade.

All the materials that have been put into the Monroe car from the Tungsten steel of the valves to the No. 1 leather trimmings are of the best and have been carefully selected for the particular function they have to perform. It is by high quality of material as well as extreme care in design that we are enabled to make the Monroe car so light in weight and yet achieve so great a measure of reliability, stability and lasting power. The Monroe car including every item which makes for service, convenience and comfort sells at \$985

# Engineering Trend MONROE CAR?



# To Dealers -

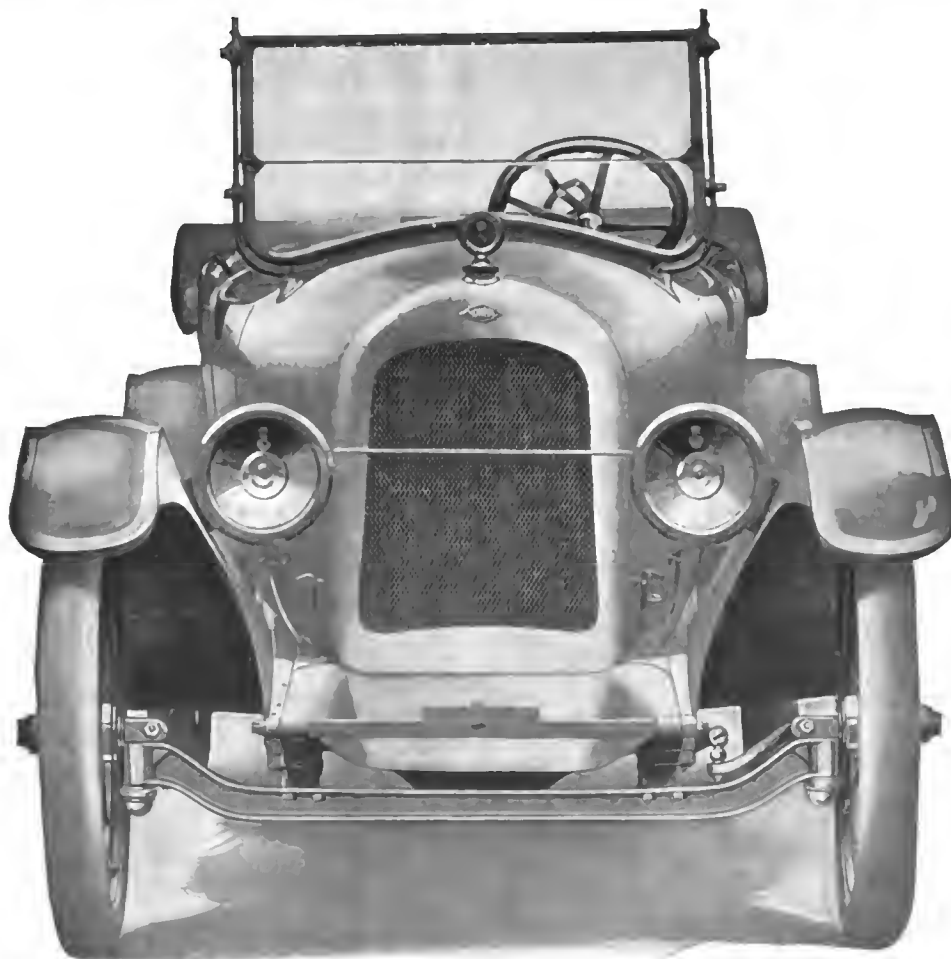
The Monroe Car is no ordinary proposition. The brief discussion of the features of the car in the inside pages of this advertisement is more than enough to show you that the dealer who sells the Monroe has a proposition that will sell on construction and dollar for dollar value.

Dealers who appreciate doing business on the basis of a straight proposition should get in touch with us, and let us have your references. If you are the type of man qualified to sell cars in accord with the Monroe principle we will send you our terms and discounts.

In your work with us you will have the Monroe organization behind you and a proposition that makes for staple business and satisfied customers.

MONROE MOTOR COMPANY  
PONTIAC MICHIGAN

# The MONROE



MONROE

# Climbing New Peaks of Power



As the result of introducing overhead valves into a V-Type motor and adding other features of design, Ferro V-Type motors produce more power per cubic inch of piston displacement or per pound of weight than any other standard poppet valve motors.

This, of course, means more than power-production alone. It means exceptional flexibility.

The horsepower per cubic inch of piston displacement of the four Ferro models is as follows:—

Model 8-35	.218 h. p.	Model 8-60	.225 h. p.
Model 8-48	.242 h. p.	Model 12-80	.228 h. p.

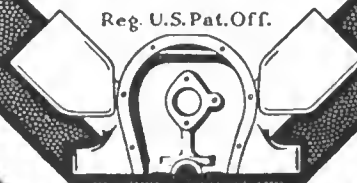
To remarkable power development and flexibility Ferro V-Type motors add unusual accessibility, freedom from vibration and low up-keep cost.

Write for full information.

THE FERRO MACHINE & FOUNDRY CO.  
193 Hubbard Avenue Cleveland, Ohio

## FERRO MOTORS

Reg. U.S. Pat. Off.



Please mention The Automobile when writing to Advertisers



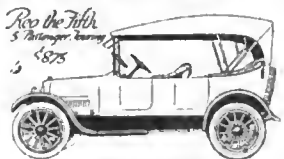
# When You Come to Chicago Look the Reo Line Over



Four Cylinder Reo  
Roadster 5 Passenger \$875



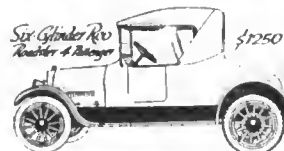
Reo Six Roadster  
with 4th Gear, Top \$1025



Reo the Fifth  
5 Passenger, Touring \$875



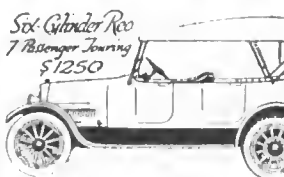
Four Cylinder Reo  
with 4th Gear \$1025



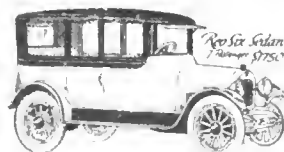
Six Cylinder Reo  
Roadster 4 Passenger \$1250



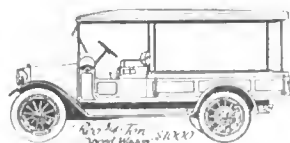
Reo Six Roadster  
with 4th Gear \$1400



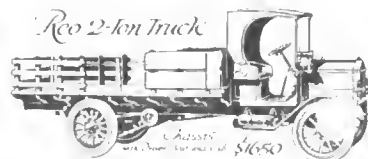
Six Cylinder Reo  
7 Passenger Touring \$1250



Reo Six Sedan  
5 Passenger \$1250



Reo 2-ton  
Special Model \$2800



Reo 2-ton Truck

Chassis  
with 4th Gear \$1650

NO, WE ARE NOT looking for dealers—our present problem is to supply those we have now.

AND WE WILL SAY that, man for man, they are as clean cut, high grade a class of dealers as there are in the world.

SO THAT ISN'T THE IDEA of this advertisement.

YOU'VE BEEN A'HANKERING to look over this Reo line for a long time—when your customers weren't present to see you do it.

YES YOU HAVE—You know you have. Every automobile distributor feels that way about Reos, regardless of what line he happens to be selling now.

THERE'S A TOMORROW COMING—and you are looking forward to that. You know that it is just possible there may be a chance, some time, for you to get the Reo line for your territory.

YOU HEAR SO MUCH about the wonderful endurance, the dependability and low upkeep cost of Reos from customers, you naturally want to look and see for yourself how we Reo Folk do it.

FROM YOUR EXPERIENCE with other cars you can scarcely credit the stories users tell you about Reos—yet you know it must be true, for you hear the same tales so often.

SO HERE'S YOUR CHANCE! All the Reos will be on view at our Chicago branch show week. Come in and see them. We won't tell! And you'll be as welcome as if you were a Reo dealer now—for there's a tomorrow coming you know.

BY THE WAY, we Reo Folk have always looked rather to that tomorrow than to the immediate present—that's why we've always built Reos the way we have.

THERE ARE TEN REO models this season—four fours, four sixes and two trucks. Can't show the trucks at the Coliseum—so you'd better come to the branch and see them all—and get acquainted.

## Reo Motor Car Company

Lansing, Michigan

Chicago Branch: 1218-20 Michigan Avenue

178A

All Prices are f.o.b. Lansing, Michigan

"THE  
GOLD STANDARD  
OF VALUES"

# Ten Thousand Cars at the Yale-Harvard Game



*Cars Parked Outside Yale Bowl, Nov. 25th*

*Photo by Pech Photo News, Inc.*

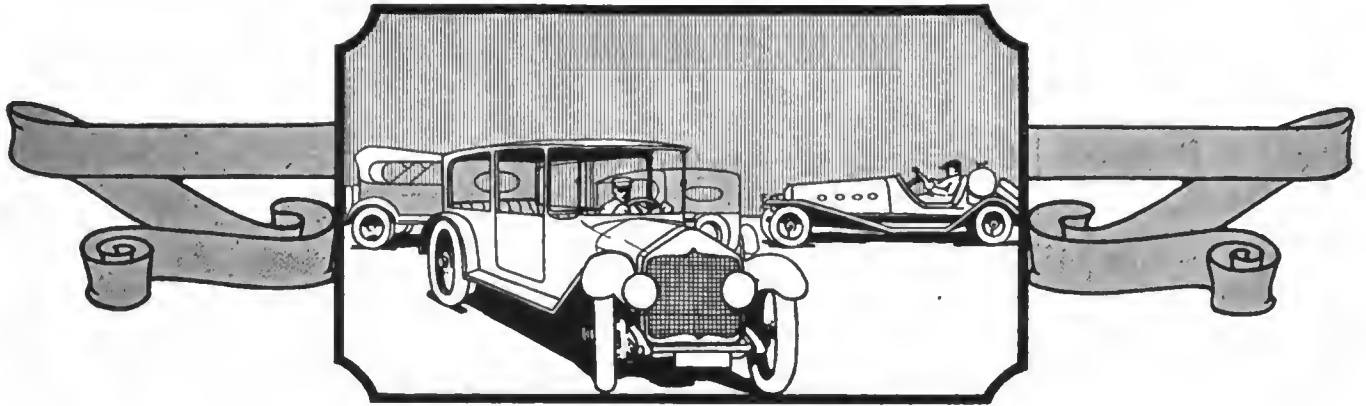
Remove the wheels, differential housings and gear box covers of these cars, and you would find New Departure Ball Bearings in the majority—doing their work silently, efficiently, indefinitely, and perhaps even unknown to the owners.

The finest cars in America are now equipped with New Departures—and yet the volume of our output is sufficient to take care of 80% of present models.

Quality in quantities as exemplified in New Departure Ball Bearings, is one of the most remarkable achievements of modern times.

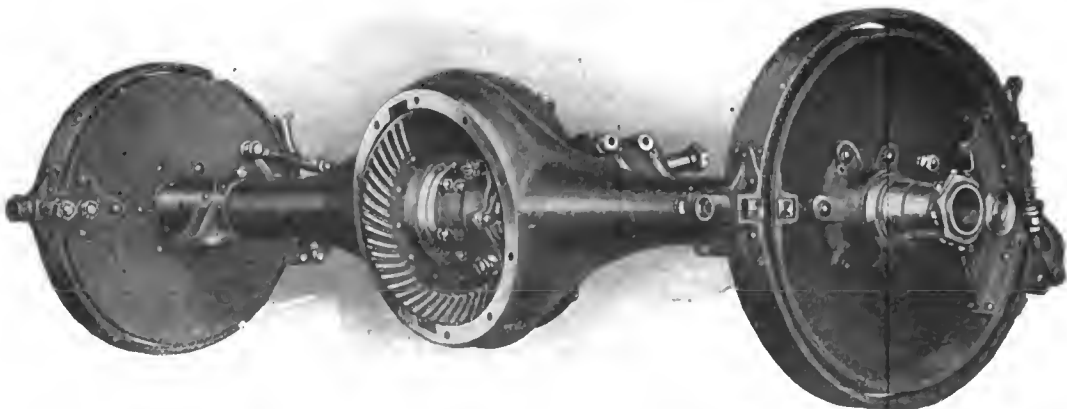
**NEW DEPARTURE  
BALL BEARINGS**

THE NEW DEPARTURE MANUFACTURING CO., BRISTOL, CT.—DETROIT



# Association

**B**UILT of material proved through years of use to be absolutely qualified for the purpose it is to fulfill—following the lines of construction and design approved by the foremost engineering authorities—it is only natural that Columbia Axles should be associated with the finest makes of motor cars—and that they should be chosen by the makers without hesitancy.



In thousands of high grade cars the ability of Columbia Axles to operate through an unusually long term of service without repairs or adjustments whatsoever has proved their right to this association.

If you are interested in the manufacture, sale or purchase of an automobile, it will be of interest to let us tell you more about Columbia Front and Rear Axles. A booklet fully describing them will be gladly sent on receipt of your inquiry. Write us today.

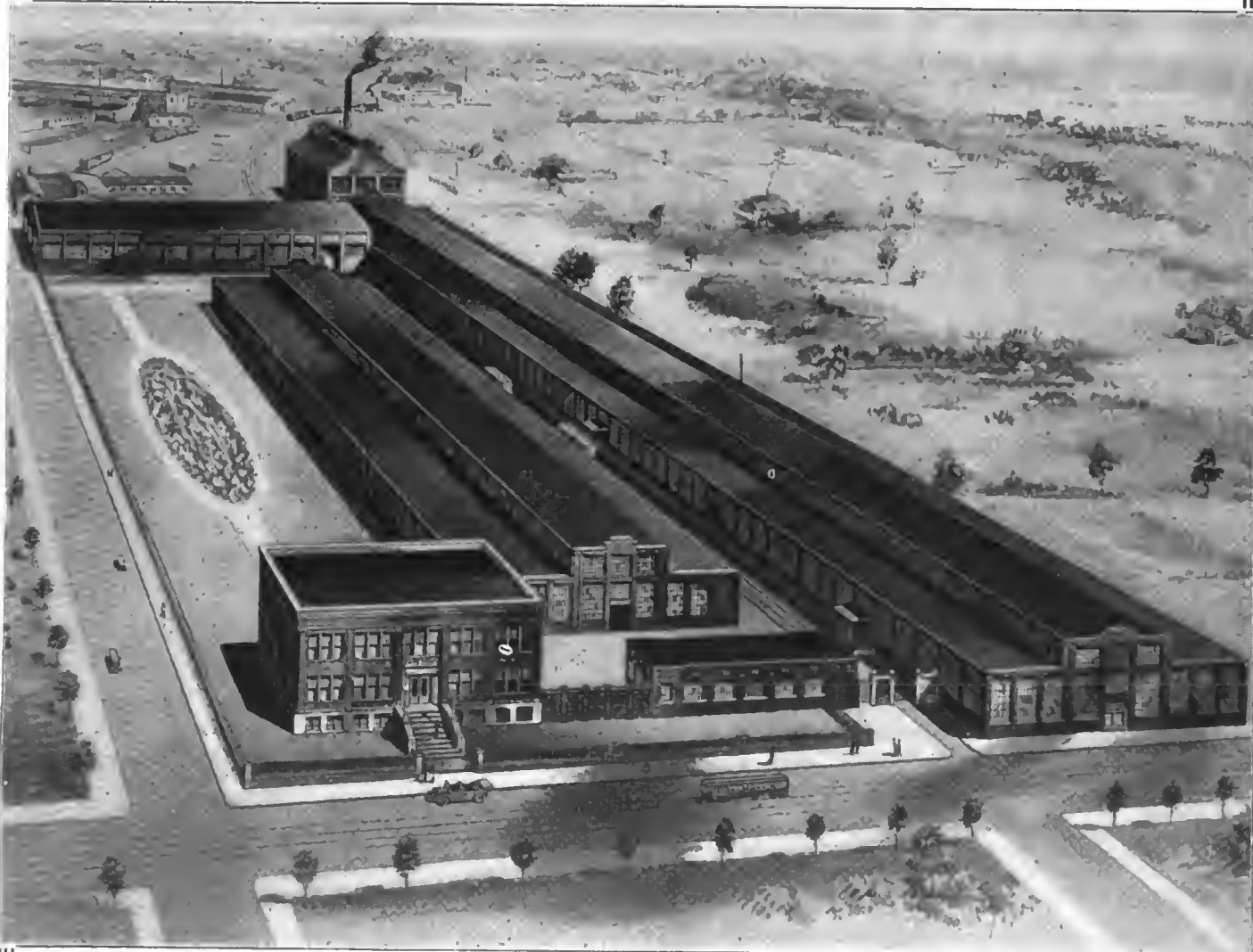
**THE COLUMBIA AXLE CO., Cleveland, Ohio**



# COLUMBIA AXLES

Please mention The Automobile when writing to Advertisers

THE  
**Parish & Bingham Co.**  
CLEVELAND, OHIO



*The Standard of Quality and Service*

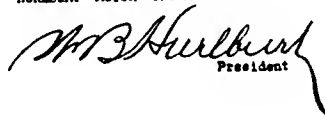
**AUTOMOBILE FRAMES AND  
LARGE STEEL STAMPINGS**

**OUR ENGINEERING FORCE AT YOUR DISPOSAL**

Please mention The Automobile when writing to Advertisers



# and Mr. Hurlburt Knows bearings

MADE IN NEW YORK	COMMERCIAL LETTER
<b>HURLBURT MOTOR TRUCK CO.</b> PIONEER MAKERS OF WORM DRIVE TRUCKS PATENT, RESERVATIVE AND SALES OFFICES THIRD AVENUE AND HARLEM RIVER NEW YORK	
TELEPHONE BRUNNEN 101	November 17th, 1916
Mr. O.A. Ide, Sheldon Axle & Spring Co., Wilkes-Barre, Pa.	
My dear Mr. Ide.	
We are getting two and three different kinds of bearings with our axles, and I am anxious to know whether you cannot give us Wright bearings throughout. We have had better success with Wright bearings than anything we have used heretofore. We are using them in our rear axles entirely, and are considering using them in our transmissions. I will therefore appreciate it if you can supply us with Wright bearings entirely with Sheldon axles.	
Yours very truly, HURLBURT MOTOR TRUCK COMPANY  President	
Dictated by Mr. Hurlburt.	

Mr. Hurlburt builds motor trucks and puts his name on them. He is proud of them. They are good trucks. (Everybody concedes this fact.) He is particular about the quality of their physical structure and the dependability of their mechanical parts. Nothing short of the best is good enough.

He has tried many bearings. Some of them were very good; the best of their several types; but not quite up to the standard of efficiency he was striving to attain.

His quest for the best led him, as a matter of course, to a test of Wright Taper Roller Bearings. And the natural result is reflected in his letter to the Sheldon Axle and Spring Company reproduced on this page.

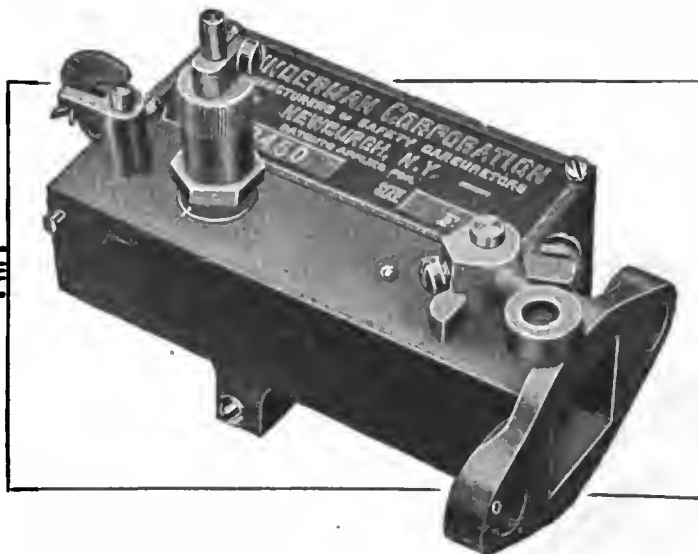
May we send you a booklet telling why this was a "natural result"?

## WRIGHT ROLLER BEARING COMPANY

CROZER BUILDING, PHILADELPHIA, PA.

Factory: Spring City, Pa.

Please mention The Automobile when writing to Advertisers



# The Verdict of the New York Show

With all due regard to business modesty, we nevertheless truly report that the carburetor which attracted the greatest attention at the wonderful and complex exhibit of accessories at the New York Automobile Show at Grand Central Palace was the

## \$5 SUNDERMAN \$5 Vacuum Carburetor

F. O. S.  
Newburgh

F. O. S.  
Newburgh

\$6.50 with elbow for attachment where manifold is not cast in head. Ford and Metz cars do not need elbow

\$6.50 with elbow for attachment where manifold is not cast in head. Ford and Metz cars do not need elbow

**T**HERE was a reason for it. Three million motorists are looking for a carburetor which will give an adequate gas supply economically under all conditions of driving—in high speed or low, in wet or dry weather, warm or cold, in high or low altitudes. When they find it they will buy it—and the great response that the SUNDERMAN VACUUM CARBURETOR has met proves that it supplies the need and does the work.

**OWNERS:** See your dealer or write us at once and let this carburetor begin to make good for you. A busy car will save the purchase price in 3 days. Take the high cost out of your 1917 driving by ordering now.

**MANUFACTURERS:** Let us help you to solve your motor difficulties. We know we can aid you, and we are willing to prove it under any test.

**W**E claim for it—and you can prove it yourself—the following advantages:

- Simplicity, More Power, Easier Starting, Greater Flexibility,
- Quicker Acceleration, Speedier Pick-up, Greater Hill-climbing Ability, and a Saving of 25 to 50% in Gasoline

**DEALERS:** We talk to you on the basis of an exceptionally successful year just closed. **THE SUNDERMAN VACUUM CARBURETOR MAKES GOOD FOR YOU AS WELL AS YOUR CUSTOMERS.** Let us hear from you quickly—it will be to your advantage.

See us at the Chicago Show, Armory Balcony, Space 39

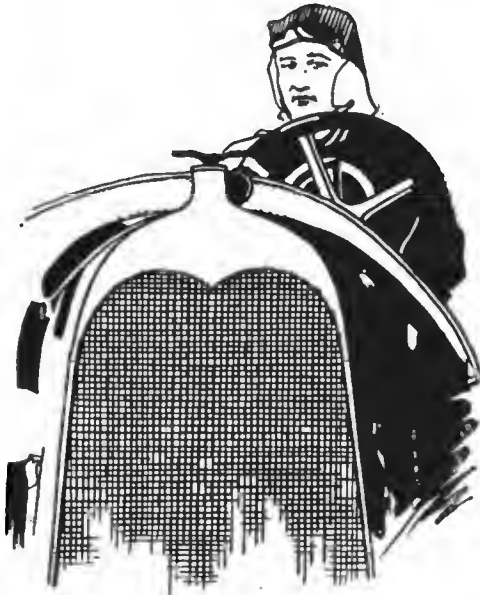
**SUNDERMAN CORPORATION**  
5 Chambers Street,  
NEWBURGH, N. Y.

Western Sales Office: 403 Kresge Bldg., Detroit, Mich.

See us at the Chicago Show, Armory Balcony, Space 39

# VICTORIES =

Nothing demonstrates the position of FEDDERS Radiators in the American automobile game more clearly than the results of the races. Taking the racing results since mid-summer, we want to call your attention to the performance of cars equipped with



Here is a résumé of the Fedders' racing record for 1916.

Thirteen "firsts" out of twenty-seven officially sanctioned events. Forty-two "places" finished—and no Fedders-Equipt car was delayed at any time or forced to withdraw on account of cooling trouble.

## 1916 FEDDERS VICTORIES

<b>COONEY ISLAND CUP RACE, 20 MILES, NEW YORK, MAY 13.</b>		
Car and Driver		Finish
Maxwell—Rickenbacher	.....	4
Maxwell—Henderson	.....	5
<b>METROPOLITAN TROPHY RACE, 150 MILES, NEW YORK, MAY 13</b>		
Maxwell—Rickenbacher	.....	1
<b>INDIANAPOLIS INTERNATIONAL SWEEPSTAKES, 300 MILES, MAY 30</b>		
Maxwell—Henderson	.....	6
Premier—Wilcox	.....	7
<b>DES MOINES 150-MILE RACE, JUNE 24</b>		
Maxwell—Henderson	.....	2
Maxwell—Rickenbacher	.....	3
Stuts—Cooper	.....	5
<b>SIoux CITY 10-MILE RACE, JULY 8</b>		
Premier—Wilcox	.....	4
<b>SIoux CITY 20-MILE RACE, JULY 8</b>		
Premier—Wilcox	.....	1
<b>SIoux CITY 50-MILE RACE, JULY 8</b>		
Premier—Wilcox	.....	1
<b>OMAHA 50-MILE RACE, JULY 15</b>		
Maxwell—Rickenbacher	.....	2
Maxwell—Henderson	.....	3

<b>OMAHA 150-MILE RACE, JULY 15</b>		
Maxwell—Henderson	.....	4
<b>TACOMA MONTAMARATHON, 300 MILES, AUG. 5</b>		
Maxwell—Rickenbacher	.....	1
Maxwell—Henderson	.....	5
<b>CINCINNATI DERBY, 300 MILES, SEPT. 4</b>		
Peugeot, Aitken	.....	1
<b>INDIANAPOLIS 20-MILE RACE, SEPT. 9</b>		
Peugeot, Aitken	.....	1
Premier, Wilcox	.....	2
<b>INDIANAPOLIS 50-MILE RACE, SEPT. 9</b>		
Peugeot—Aitken	.....	1
Premier—Lewis	.....	5
<b>INDIANAPOLIS 100-MILE RACE, SEPT. 9</b>		
Peugeot—Aitken	.....	1
Premier—Lewis	.....	5
Maxwell—Henderson	.....	7
<b>ASTOR CUP RACE, 250 MILES, NEW YORK, SEPT. 30</b>		
Peugeot, Aitken	.....	1
Maxwell—Rickenbacher	.....	2

<b>GRAND AMERICAN, 250 MILES, CHICAGO, OCT. 14</b>		
Peugeot—Resta	.....	1
Peugeot—Aitken	.....	2
Maxwell—Rickenbacher	.....	3
Premier—Lewis	.....	4
Maxwell—Henderson	.....	5
Premier—Galvin	.....	6
<b>HARKNESS TROPHY RACE, 100 MILES, NEW YORK</b>		
Peugeot—Aitken	.....	1
Premier—Galvin	.....	2
Peugeot—Wilcox	.....	3
Maxwell—Henderson	.....	4
<b>VANDERBILT CUP RACE, 204 MILES, SANTA MONICA, CAL., NOV. 16</b>		
Peugeot—Resta	.....	1
Stuts—Cooper	.....	2
<b>GRAND PRIZE RACE, 403 MILES, SANTA MONICA, CAL., NOV. 18</b>		
Peugeot—Aitken—Wilcox	.....	1
Stuts—Cooper	.....	2
<b>ASCOT DERBY, 150 MILES, LOS ANGELES, CAL., NOV. 30</b>		
Stuts—Cooper	.....	2
<b>UNIVERSAL TROPHY RACE, 112 MILES, UNIONTOWN, PA.</b>		
Premier—Lewis	.....	3

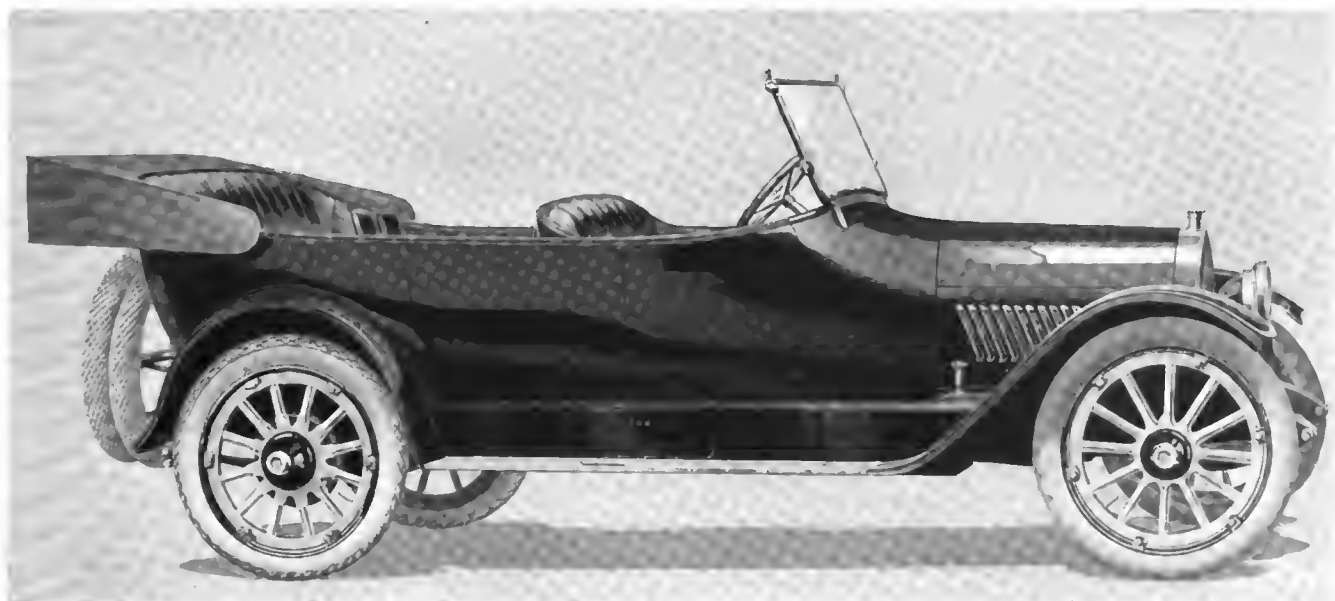
This showing proves that the FEDDERS is still in its place as the foremost American Radiator.

# FEDDERS MANUFACTURING CO., INC.

BUFFALO, N. Y.



## THE OLDSMOBILE SEVEN-PASSENGER MODEL



### • P O W E R •

THE automobile prospect wants to know what power is actually delivered to the driving wheels of a car and its proportion to the total car weight. The New Series Oldsmobile gives him more power than he thought possible in a car of its size and price.

In the first place it is a car of light weight—the seven-passenger touring car weighs approximately 3,000 pounds, ready for the road.

It has an eight-cylinder motor with balanced crankshaft and nine-ounce aluminum alloy pistons. It develops 50 horse power, brake test. This power, continuously applied by the overlapping impulses of eight cylinders, in a car of such light weight, produces a flexibility that makes gear changing almost unnecessary.

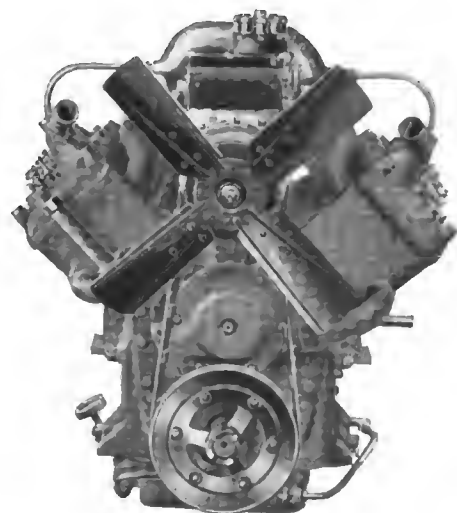
The car buyer of today wants slow speed in high—quick acceleration—plenty of power for hills—quietness—smoothness.

The New Series Oldsmobile has all these characteristics in a greater degree than he ever hoped for. It is a delight to demonstrate it because it “makes good” far beyond expectations.

Some new dealers will be added to the Olds organization to take care of the big demand for the New Series Oldsmobile.

We shall consider applications from responsible dealers in open territory who will carry the Oldsmobile as a leader.

OLDS MOTOR WORKS  
*Lansing, Michigan*



NEW SERIES

# Oldsmobile

NINETEENTH YEAR

## Details of the New Series

**WHEEL BASE**—120 inches, with unusually ample body, due to short, compact motor.

**MOTOR**—Eight cylinder, V-type, high speed motor with balanced crank shaft, light weight, drop forged connecting rods, and nine-ounce aluminum alloy pistons, reducing internal resistance, vibration, and bearing pressure to a minimum. I-head with inclined valves. Cylinders cast four en-bloc with adjoining half of crank case, only two castings, bearings in left-hand block—a patented feature. Three-point suspension. Motor develops 50 horse power brake test.

**LUBRICATION**—Force feed by gear pump direct to bearings. Pressure indicated by oil gauge on dash.

**ELECTRIC SYSTEM**—Oldsmobile-Delco lighting, starting, and ignition.

**SPARK ADVANCE**—Automatic.

**CABURETOR**—Automatic compensating type, minus springs, water jacketed.

**GASOLINE SYSTEM**—Vacuum feed type, gasoline tank in rear.

**TRANSMISSION**—Unit with motor, selective type, center control. Three speeds forward and reverse. Hardened steel gears, transmission shaft mounted on ball and roller bearings.

**CLUTCH**—Leather faced, cone type.

**DRIVE**—Hotchkiss type, through rear springs. Tubular drive shaft with two large universal joints.

**REAR AXLE**—Full floating, spiral bevel type.

**BRAKES**—Service brakes, external contracting; emergency brakes, internal expanding. Brakes adjustable by thumb nut.

**SPRINGS**—Front, semi-elliptic; rear, three-quarter elliptic, underslung.

**UPHOLSTERY**—Extra quality long grain, bright finish, black leather, box pleated, with no buttons to gather dust and dirt.

**DASH**—Walnut, with nickel finished instruments, mounted flush—oil pressure gauge, speedometer, eight-day clock, ammeter, lighting and ignition switches.

**LAMPS**—Double bulb headlights, tail light, dash light, tonneau light.

**TIRES**—33 x 4 on all but 7-passenger which carries 34 x 4. Non-skid on rear wheels throughout.

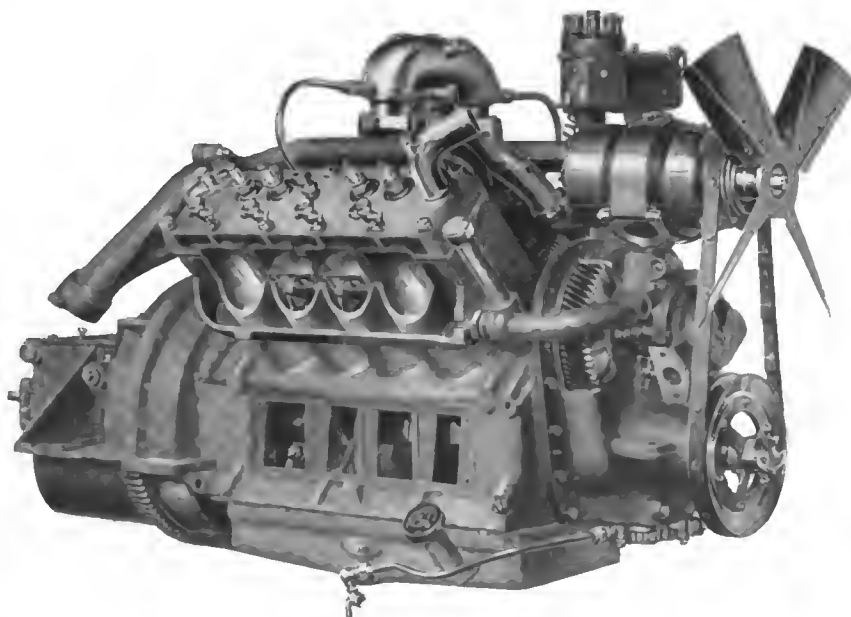
### The Oldsmobile line comprises

Seven Passenger Touring Car	Sedan
Five Passenger Touring Car	Cabriolet
Club Roadster	Convertible Roadster

## Club Roadster

This is a most ingenious design to combine roominess and beauty of line.

While it is called a four-passenger car, it seats five comfortably. Tremendous popularity is definitely predicted for the car by every dealer who has seen it. Price \$1295, f. o. b. Lansing.



OLDS MOTOR WORKS, LANSING, MICHIGAN



# A Serious Matter to Buy Rubberized Fabrics

EVERY BUYER has to meet the same problem every year. He is between two fires. He must keep up the appearance of his top and curtains, and at the same time keep his cost down to the very lowest standard.

It is then that

## **BULL DOG QUALITY**

in rubberized fabrics solves the problem

**BULL DOG QUALITY** is absolutely waterproof, and every yard manufactured is inspected most carefully, and carries a guarantee that is backed by ample responsibility.

Is it any wonder that **BULL DOG QUALITY** in rubberized fabrics is used today on so many of the better cars manufactured?

Send for samples and prices, or write us your particular requirement.

**L. J. MUTTY COMPANY**  
BOSTON MASS.



## THE DIFFERENCE

One instrument has a temperature range from 32 degrees to 212 degrees *compressed within two inches*. The ordinary household thermometer from 32 degrees to only 100 degrees within *four to six inches*.

# BOYCE MOTOMETER

while simple to one not skilled in thermometer manufacture is in reality a masterpiece in the thermometer industry.

The great success of this motor-heat indicator is due solely to its accuracy; such an instrument, unless accurate, is worthless on any car.

One half million of these instruments are in use, and the trade takes no chance in selling them.

- Standard Model . . . \$10.00
- Junior Model . . . 5.00
- Midget Model . . . 2.50

Write for demonstrating stand and circulars.

**MOTO-METER COMPANY, Inc.**  
Long Island City, N. Y.



Please mention The Automobile when writing to Advertisers

**PERLMAN**

**DEMO  
UNTABLE RIMS**

**Perlman  
Rim Plant, Jackson, Mich.  
Largest in the World  
Production—5,000 Sets a Day**

**Perlman  
Rim Corporation  
Sales Department  
1790 Broadway, New York**

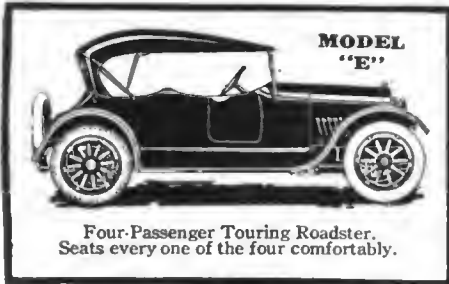
The advertisement features a large wreath with the name 'PERLMAN' arched across the top and 'DEMO UNTABLE RIMS' arched across the bottom. In the center is a circular illustration of a factory complex with multiple buildings and a tall chimney, set against a sky with clouds and a sun or moon. Two rectangular boxes with decorative borders are positioned on either side of the central illustration, containing text about the company's plant and sales department.

Please mention The Automobile when writing to Advertisers

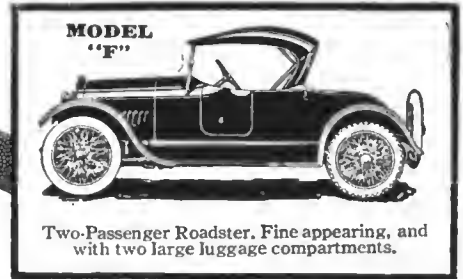


Can a quality car be built to sell under \$1,000?

Yes! here it is!



MODEL "E"  
Four-Passenger Touring Roadster. Seats every one of the four comfortably.



MODEL "F"  
Two-Passenger Roadster. Fine appearing, and with two large luggage compartments.

For seven years we built motor cars selling up to \$3,000, and good value for the money. A year ago we entered the lower-price field with a car under \$1,000. It was built in the same factory and by the same men who had hitherto built our higher-priced cars. The product of a factory and organization so specialized and drilled in high quality production, cannot but carry high quality in it. The *Elcar* last season was *the Quality Car Under \$1,000*.

# The Newest Elcar—the 1917 Elcar at \$845

Represents more sheer value for each individual dollar of price than we have ever before been able to give in our entire *forty-four years* of manufacturing experience. It is a larger car, with 115-inch wheel base. Each model is as roomy as one would care to have a car of the same body type—no skimpiness anywhere. The same workmanship goes into the construction and into the finishing that went into our cars at \$2,000 and more. It is a car of distinctive beauty, and with no suggestion of that "turned-out-by-the-million" look.

Further, the newest *Elcar* is better than ever mechanically. It has the finest type of *full-floating* rear axle; *spiral bevel* driving gears;

a *seven plate dry disk* clutch, and other high class features concerning which we must refer you to our catalog, which goes into even the minute details.

If you want a car to be proud of for appearance and performance; complete in every particular; large and roomy; an easy driver and an easy rider; a car to give you long and dependable service, you need pay no more than the price of the *Elcar*.

**Write for Our 24-Page Illustrated Catalog**

showing all models and the more important mechanical parts.

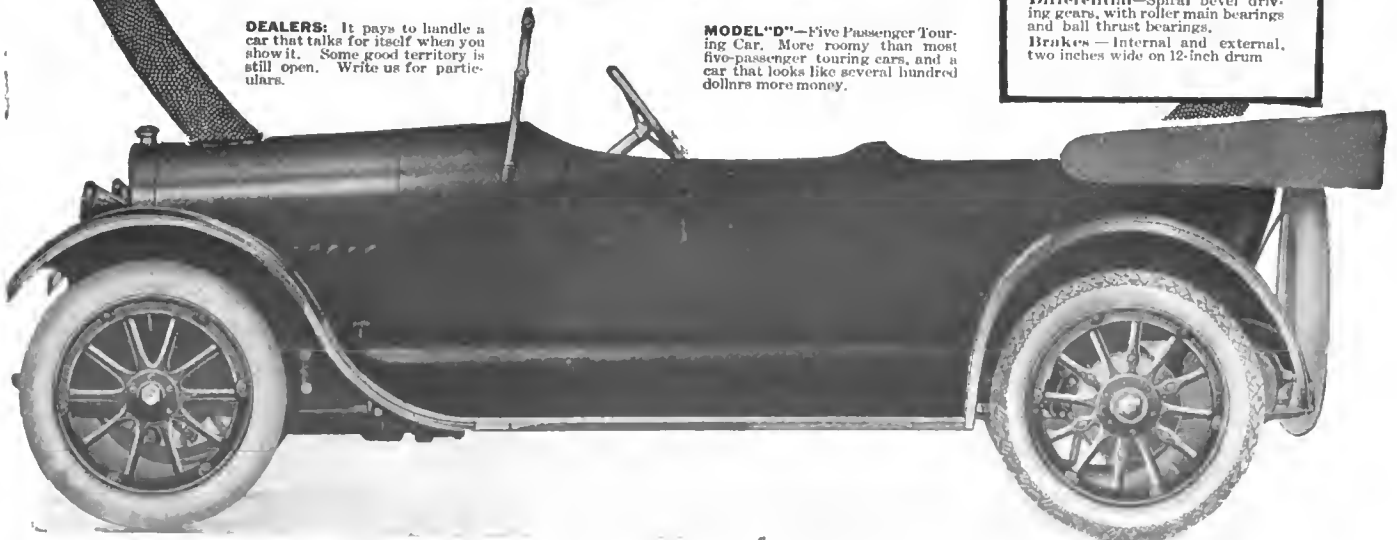
### A Few ELCAR SPECIFICATIONS

- Wheel Base**—As long as some cars selling up to \$3,000 and more—115 in.
- Motor**—4-cylinder; long stroke; high speed; 34.7 h.p. at 1,800 r.p.m.
- Fuel Supply**—Stewart vacuum system.
- Ignition**—Deleo automatic spark advance with manual control.
- Starting and Lighting**—Dyneto two-unit; double-bulb headlights; Willard storage battery.
- Clutch**—Dry multiple disk—seven plates, steel on Raybestos.
- Rear Axle**—Full-floating with roller bearings at each end of wheel hubs.
- Differential**—Spiral bevel driving gears, with roller main bearings and ball thrust bearings.
- Brakes**—Internal and external, two inches wide on 12-inch drum.

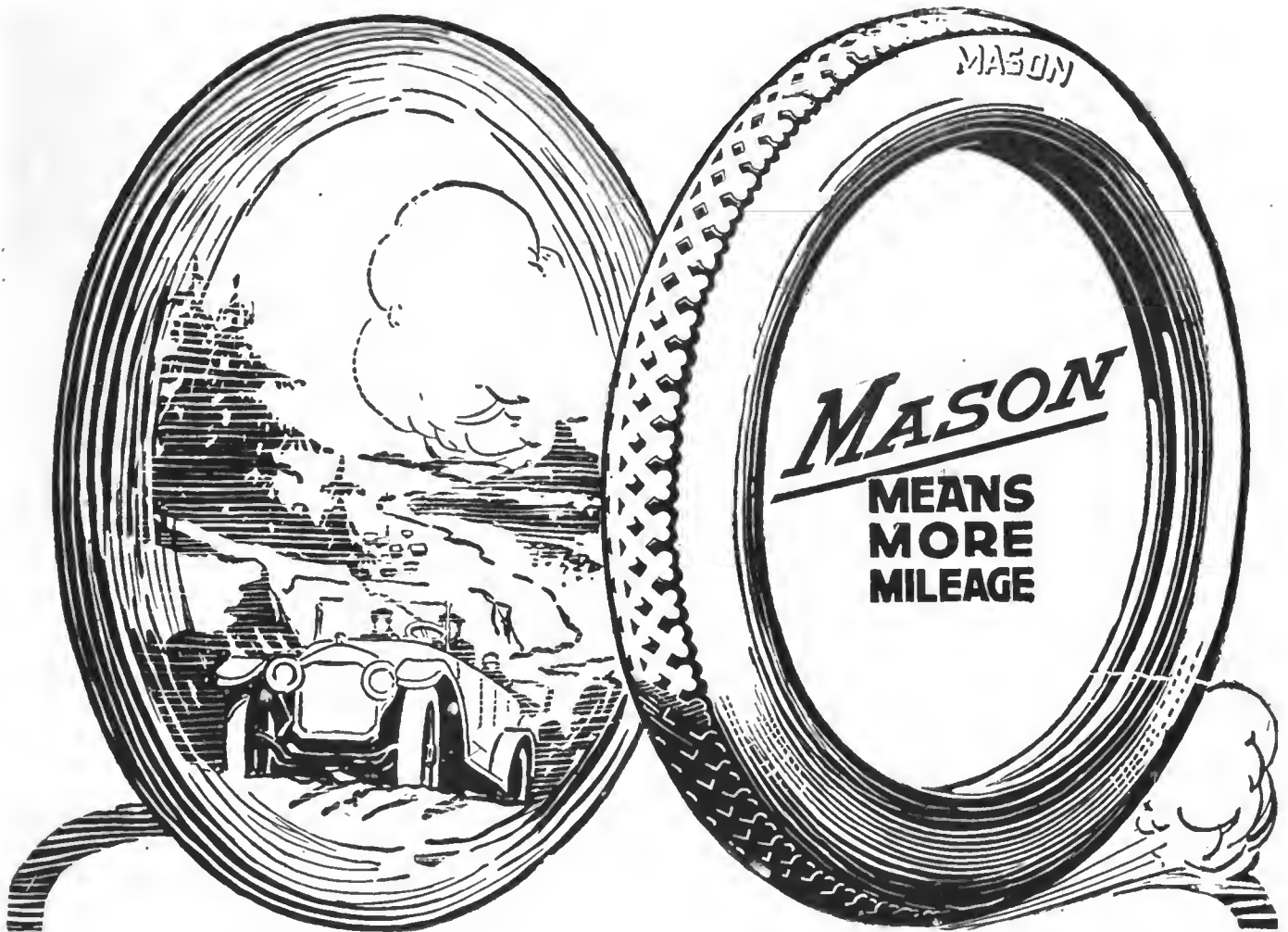
**Elkhart Carriage & Motor Car Company**  
C 778 Beardsley Avenue, Elkhart, Indiana

**DEALERS:** It pays to handle a car that talks for itself when you show it. Some good territory is still open. Write us for particulars.

**MODEL "D"**—Five Passenger Touring Car. More roomy than most five-passenger touring cars, and a car that looks like several hundred dollars more money.



Please mention The Automobile when writing to Advertisers



## The Mason Sales Plan Begins with the Dealers Point of View

**I**N the first place, Mason Tires are of that substantial quality that builds "repeat" sales—and keeps customers pleased with the foresight and progressiveness of their garagemen.

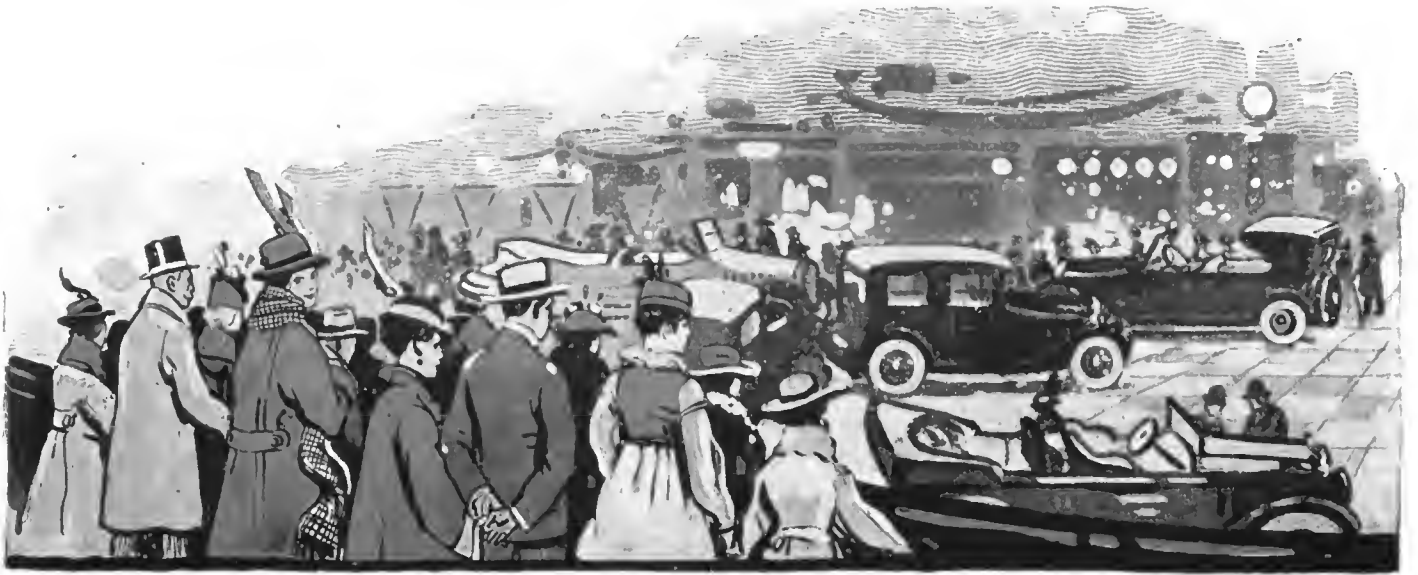
Again, Mason Tires sell at popular prices.

And Mason popularity in the dealer world is increasing rapidly because the Mason selling plan *really* adheres to the policy of small manufacturers' profit and big production.

*Only a few distributing territories remain open; write us today for information concerning your territory.*

***MASON*** Tire and Rubber Company  
Kent, Ohio

Akron Suburb.



# JOHNS—

## Displaying Johns-Manville Motor-Car Accessories —a popular line with every jobber and dealer

**The Products** First, because each product, whether Brake Lining, Fire Extinguisher, or Speedometer, has been held to the most rigid factory standard as to material and workmanship. And the new refinements of design which each year brings to motor-car accessories will all be found in the Johns-Manville Line.

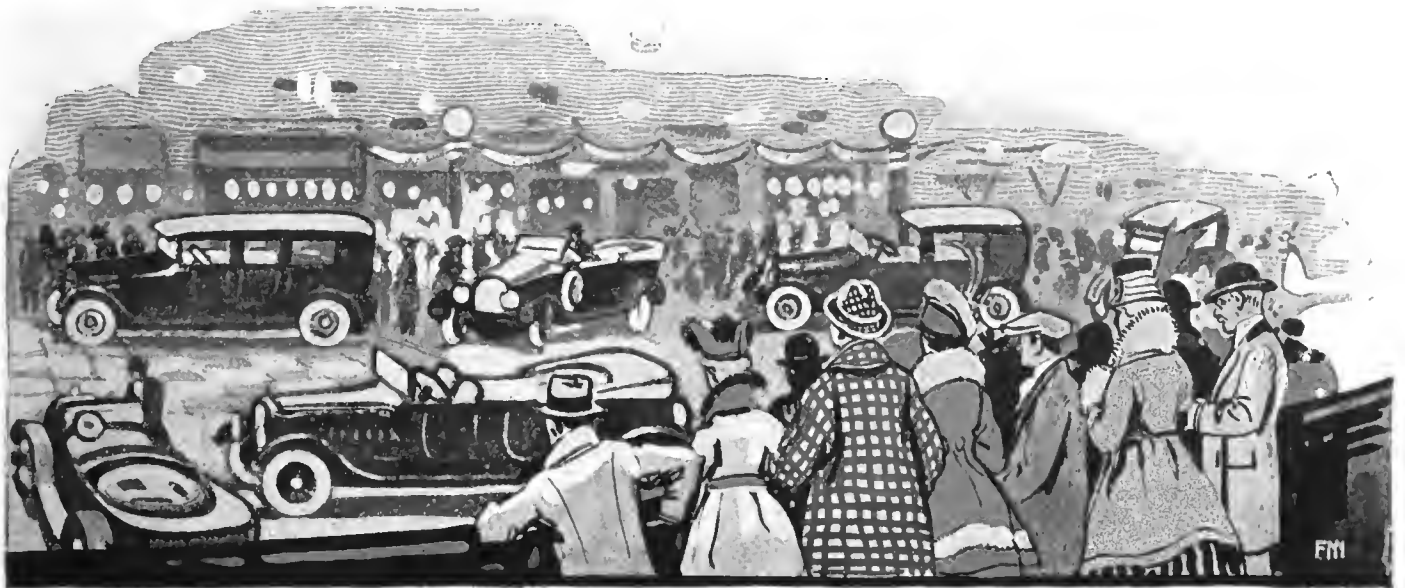
**Sales Policy** Second, through a sales policy of profit protection for all concerned. We will sell these accessories only to the legitimate trade, and only through recognized trade channels. To the dealer this means uniform discounts, generous and rigidly maintained regardless of size of order—quick turnovers and profitable margins without serious tie-up of capital. To the

jobber it means dealer support and enthusiasm, backing up a standardized and quick-selling line of indispensable accessories.

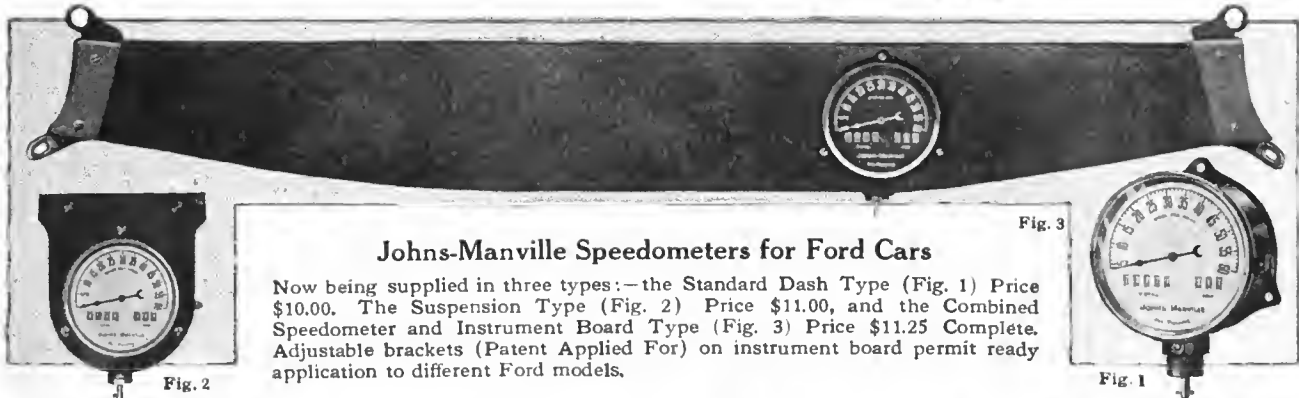
And third, **Advertising Policy** through a broadly distributed consumer demand, developed by extensive and consistent national advertising, Johns-Manville will be a familiar name in the accessory field this year.

So study the items illustrated here—and in the interests of your own profit sheets, get complete details from the nearest Johns-Manville Branch.





# MANVILLE



### Johns-Manville Speedometers for Ford Cars

Now being supplied in three types:—the Standard Dash Type (Fig. 1) Price \$10.00. The Suspension Type (Fig. 2) Price \$11.00, and the Combined Speedometer and Instrument Board Type (Fig. 3) Price \$11.25 Complete. Adjustable brackets (Patent Applied For) on instrument board permit ready application to different Ford models.

Fig. 2

Fig. 3

Fig. 1

**J-M Fire Extinguisher**  
Works two ways—either by pumping while discharging, or by first pumping up air pressure and then discharging. Retails at \$8, brass or nickel finish, bracket included.



### J-M (Mezger) Soot-Proof Spark Plug

Soot-proof, leak-proof, heat-proof. Insures an intensely hot spark. Built in two units for easy disassembling. Price 75c.

### J-M Non-Burn Asbestos Brake Lining

A safe, dependable and economical asbestos brake lining. By controlling the source of the raw material, Johns-Manville Asbestos, we are able to maintain the quality which assures its steady use by your trade.



Please mention The Automobile when writing to Advertisers

# National Speedway Tires

Made in  
POTTSTOWN, PENNA.

## Individually Built

Here in the NATIONAL factory our daily production of tires is sufficiently large to keep our overhead and production costs at a minimum.

Yet we make few enough tires each day to insure each tire receiving individual workmanship, careful supervision and rigorous inspection.

Other manufacturers of quality tires may use as fine a grade of rubber and fabric

but we doubt that there are many manufacturers who give to each tire the individual attention each NATIONAL "Speedway" receives.

To a large extent the ability of "Speedway" Tires to consistently deliver more than the average amount of mileage and to withstand more than the

average amount of punishment is due to this extra care exercised in their manufacture.

For quality, stamina, strength and general dependability just test a NATIONAL "Speedway" against the tires you are now using.

### Dealers—Jobbers

Our plan of co-operating with and protecting the dealer in his territory has resulted in a bigger business for more than one tire distributor

If you have not yet contracted for your next season's supply of tires, find out more about the NATIONAL proposition.

A letter from you will immediately bring complete personal information.

NATIONAL RUBBER COMPANY, Pottstown, Pa.

*"Speedway" tires are not as yet for sale in all cities. If your dealer cannot supply you, write direct. Prices moderate.*

**5,000  
Miles  
Guaranteed**

9



Please mention The Automobile when writing to Advertisers

# THE STAMP OF APPROVAL of Twelve Great Automobile Engineers— and What It Means to the Dealers

Since the last Warner-Lenz advertisement in Collier's and The Saturday Evening Post of January 6th, four new names have been added to the list of famous cars now using Warner-Lenz as standard equipment. These are White, Pathfinder, Doble Steam and Peerless. Previously we had announced the Packard, Marmon, Stutz, Singer, McFarlan, Hal, Ohio Electric and Daniels Eight.

Over 300,000 pairs of Warner-Lenz have been sold through our dealer organization to individual owners of cars.

Warner-Lenz have been adopted by the big manufacturers for one sole reason—this invention, to their minds, has solved night driving problems. Ordinary lenses would and do cost less—but the engineers of these companies insist on the best.

## NON-GLARE

Drivers are equipping their cars with Warner-Lenz so as to do away with the dangerous glare and the weak dimmer. This popularity extends all over the United States.

IF THESE BIG COMPANIES ARE SPENDING MONEY TO EQUIP ALL OF THEIR CARS WITH WARNER-LENZ AND OVER 300,000 OWNERS HAVE ALREADY BOUGHT, ISN'T IT A FINAL REASON FOR YOUR HANDLING WARNER-LENZ AND SHARING THE PROFITS?

For every month during the Spring and Summer we have planned big page advertisements in Collier's and The Saturday Evening Post. Their combined circulation is nearly 3,000,000. We spent \$100,000.00 last year for advertising. During 1917 we will spend \$200,000.00.

Motorists all over the country have read and are reading of Warner-Lenz. Many more would buy if they only knew where to get them locally. Hundreds come direct to us—some write for names of local dealers.

## YOU CAN WIN

Every owner of a car in your community is a prospect. Warner-Lenz are bound to be universal.

It only takes a couple of minutes to insert Warner-Lenz in the lamps and there is no future service necessary. Every sale you make creates a booster. He tells others.

All laws favor Warner-Lenz. Wherever tested, they are given the O. K. of police authorities.

Warner-Lenz sales have just started. We want good dealers in every city in the country who will help us in the distribution. Let us tell you what some of our dealers are making. You will be surprised.

Write for our proposition today. Full particulars will be sent by return mail.

*Packard*  
TWIN-6

**MARMON**

**STUTZ**

**HAL**  
TWELVE



**McFARLAN**  
SIX

**OHIO**  
ELECTRIC

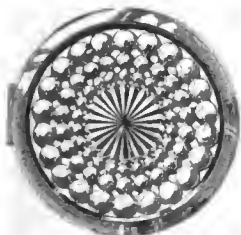
**DANIELS**  
EIGHT

*White*

*Pathfinder*

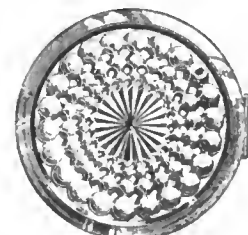
**DOBLE**  
STEAM CAR

*Peerless*



**WARNER-LENZ**

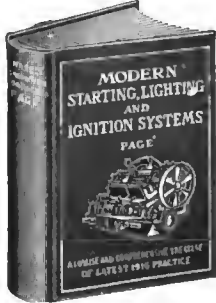
909 S. Michigan Ave., Chicago



# THE LATEST AND BEST AUTOMOBILE BOOKS

ALL 1917 EDITIONS

## Starting, Lighting and Ignition Systems



By Victor W. Pagé

A practical treatise on modern starting and ignition system practice. Includes a complete exposition of storage battery construction, care and repair. Explains all types of starting motors—generators—magnets and all ignition or lighting system units. Considers the systems of cars already in use as well as those that are to come in 1917. A book every one needs. Nothing has been omitted, no details have been slighted. A book you cannot afford to be without.

Nearly 500 pages. 297 Specially Made Engravings. 1917 Edition. Price \$1.50

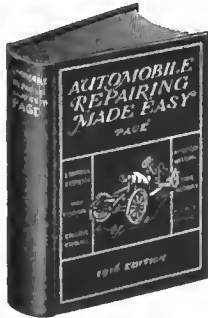
## The Modern Gasoline Automobile

By Victor W. Pagé

The most complete treatise on the gasoline automobile ever issued. Written in simple language by a recognized authority familiar with every branch of the automobile industry. Free from technical terms. Everything is explained so simply that anyone of ordinary intelligence may gain a comprehensive knowledge of the gasoline automobile. The information is up to date and includes, in addition to an exposition of principles of construction and description of all types of automobiles and their components, valuable money-saving hints on the care and operation of motor cars propelled by internal combustion engines. The book tells you just what to do, how and when to do it. Nothing has been omitted, no detail has been slighted.

850 Pages. 600 Illustrations. 12 Folding Plates. 1917 Edition. Price \$2.50

## Automobile Repairing Made Easy



By Victor W. Pagé, M.E.

A thoroughly practical book containing complete directions for making repairs to all parts of the motor car mechanism. Written in a thorough but non-technical manner. Will be found of special value to garagemen, chauffeurs and automobile mechanics; it also contains a mass of general information that will be of equal value to the motorist who takes care of his own car.

This book contains special instructions on electric starting, lighting and ignition systems. Tire repairing and rebuilding. Autogenous welding. Brazing and soldering. Heat treatment of steel. Latest timing practice. Eight- and twelve-cylinder motors, etc., etc. A guide to greater mechanical efficiency for all repairmen. You will never "get stuck" on a job if you own this book.

1000 Specially Made Engravings on 500 Plates. 1056 Pages (5 1/4 x 8). 11 Folding Plates. 1917 Edition. Price \$3.00

## The Model T Ford Car

By Victor W. Pagé

This is one of the most complete instruction books ever published. All parts of the Ford Model T Car are described and illustrated. Complete instructions for driving and repairing are given. Every detail is treated in a non-technical yet thorough manner.

This book is written specially for Ford drivers and owners, by a recognized automobile engineering authority and an expert on the Ford, who has driven and repaired Ford cars for a number of years. He writes for the average man in a practical way from actual knowledge. All parts of the Ford Model T Car are described. All repair processes illustrated and fully explained. 1917 edition.

3 Large Folding Plates. 100 Illustrations. 300 Pages. Price \$1.00

## Automobile Questions and Answers

By Victor W. Pagé

This practical treatise consists of a series of thirty-seven lessons, covering with over 2000 questions and their answers the automobile, its construction, operation and repair. The subject matter is absolutely correct and explained in simple language. If you can't answer all of the following questions you need this work. The answers to these and 2000 more are to be found in its pages.

Give the names of all important parts of an automobile and describe their functions. Describe action of latest types of kerosene carburetors. What is the difference between a "double" ignition system and a "dual" ignition system? Name parts of an induction coil. How are valves timed? What is an electric motor starter and how does it work? What are advantages of worm drive gearing? Name all important types of ball and roller bearings, etc., etc.

650 Pages. 350 Illustrations and Plates. 1917 Edition. Price \$1.50

## The Automobilst's Pocket Companion and Expense Record

Arranged by Victor W. Pagé, M.S.A.E.

This book is not only valuable as a convenient cost record but contains much information of value to motorists. Includes a condensed digest of auto laws of all States, a lubrication schedule, hints for care of storage battery and care of tires, location of road troubles in all parts of the car, anti-freezing solutions, horsepower table, driving hints and many useful tables and recipes of interest to all motorists. Not a technical hook in any sense of the word, just a collection of practical facts in simple language for the everyday motorist.

It will enable you to keep track of all your expenses. Convenient ruled pages eliminate all bookkeeping except entering a few figures daily. Shows the miles covered during each day of the year, the fuel used and cost of repairs. Tells if your tires are standing up to their guarantee, which makes of tires gives best service, etc.

Convenient pocket size, handsomely bound in Hmap leatherette cover. Price \$1.00



## Automobile Welding with the Oxy-Acetylene Flame

By M. Keith Dunham

THIS IS THE ONLY COMPLETE BOOK ON THE "WHY" AND "HOW" OF WELDING WITH THE OXY-ACETYLENE FLAME the various parts of the automobile.

Explains the apparatus to be used, its care and how to construct necessary shop equipment. The actual welding of all automobile parts is treated in a manner understandable by everyone.

Automobile owners, garage and service stations, blacksmith and machine shops, as well as industries using the oxy-acetylene flame, will find this book of the utmost value, since the perplexing problems arising when metal is heated to a melting point are fully explained and the proper methods to overcome them shown.

192 Pages. Full Illustrated. 1917 Edition. Price \$1.00

## Automobile Charts, 25 Cents Each

- Location of Carburetion Troubles Made Easy.
- Location of Ignition System Troubles Made Easy.
- Location of Cooling and Lubrication System Faults.
- Location of Ford Engine Troubles Made Easy.
- Location of Gasoline Engine Troubles Made Easy.
- Lubrication of the Motor Car Chassis.

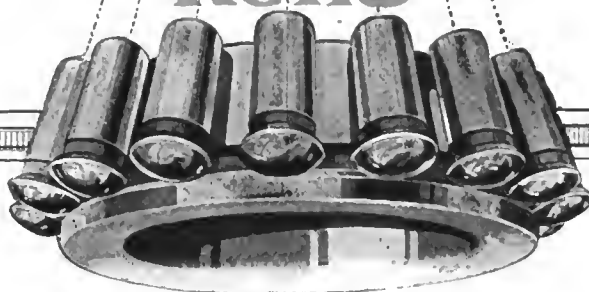
Any of these books sent prepaid on receipt of price, or a special circular of all our Automobile Books and Charts sent on request. FREE—Our new Catalog of Practical Books sent free on request.

THE NORMAN A. HENLEY PUBLISHING CO., 132 Nassau St., New York, U. S. A.

Please mention The Automobile when writing to Advertisers

# BOCK

## Everything Rolls



Bock bearings carry the tremendous loads that any roller bearing is capable of carrying.

But they do more.

They entirely eliminate wearing, grinding end friction.

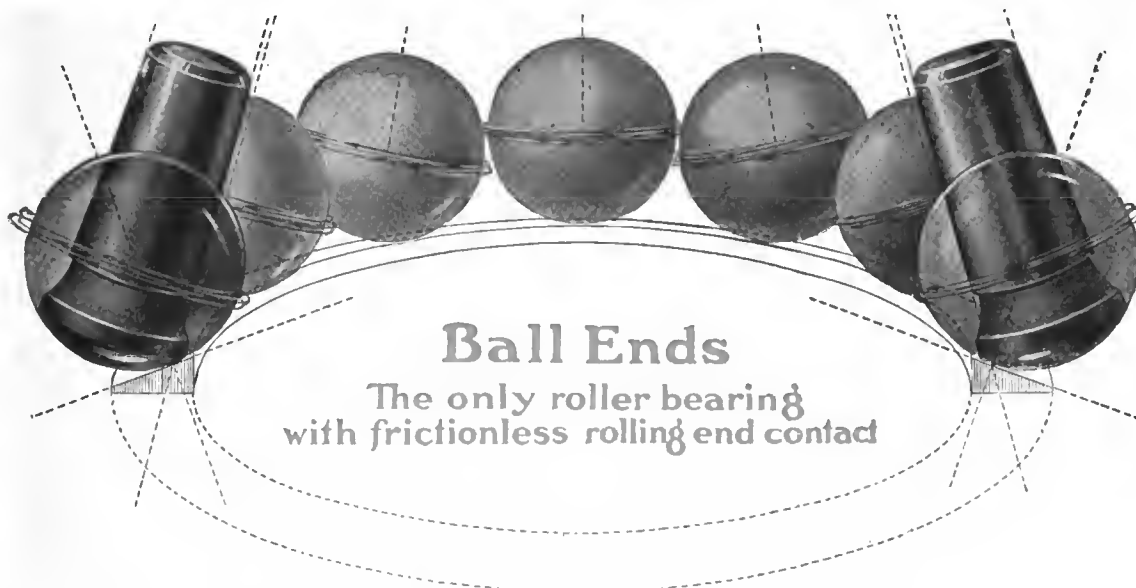
The bearing end of each Bock is the segment of a sphere. It rolls where other bearings merely scrape and slide.

Everything rolls in the Bock.

Consequently, combined with the greater strength of the roller bearing you get all the good features of the ball bearing.

Engineers are enthusiastic over the Bock.

And it is replacing all other types of motor car bearings as fast as we can fill the orders.



The Bock Bearing Company

- - - -

Toledo, Ohio





## WOODWORTH TROUBLE-PROOF // TIRES //

## 5,000 Miles of Tire Comfort— and Certainty!

The Woodworth is not only guaranteed against puncture or blow-out, but also against ordinary wear and tear. It is a lively, fast, resilient tire, made of the finest materials according to the best methods.

It is not a freak. There is no metal in it. Simply a specially prepared strip of non-wearing Chrome leather, perfectly fitted to the inner side.

While built and guaranteed to run at least 5,000 miles without tire trouble, it is actually making a much higher mileage on all sorts of roads all over the country. The tire itself is a better guarantee against tire trouble than any adjustment contract ever written.

DEALERS can sell this to anybody who wants real tire comfort and certainty. It has no rival.

We are looking for the kind of dealers who are in business to stay and who are looking for a tire that will deliver service—a tire that makes for satisfied customers. We will give these dealers exclusive territory and back them with *real* co-operation.



## WOODWORTH TROUBLE-PROOF TUBES

—are made of tough, live rubber, antimony cured. They are hand made and cross plied to guard against tearing in any direction. Ask your dealer to show you one—feel it—stretch it. Try one—protected by our full guarantee. It will save your casings and save you trouble.

WOODWORTH  
MANUFACTURING CORPORATION  
Niagara Falls, New York  
Canadian Factory, Niagara Falls, Ont.

**O**UR displays at the National Automobile Shows best reflect the conscientious manufacture of our Giant line of Electrical Devices.

Our wide range of equipment is an assurance of the most comprehensive ignition service available at our branch houses throughout the country.

*DIXIE* <sup>20<sup>TH</sup></sup>  
*CENTURY*  
*MAGNETO*

*Lighting and Starting  
Systems*

The Plug with the  
Green Jacket

**AMMETERS**

Splitdorf Electrical Co.

Newark, New Jersey.



Please mention The Automobile when writing to Advertisers



## Quick Starts on Cold Nights

Cold nights, speeds, roads, traffic—each of these conditions has its effect on a storage battery. But no matter what the conditions, a battery supervised by Prest-O-Lite Service will be a lively, healthy source of power.

There is a Prest-O-Lite Storage Battery of correct size for every make and model of car—backed by the great Prest-O-Lite Service organization that insures service of *real value* to car owners, dealers and manufacturers.

### Prest-O-Lite Exhibit at the Chicago Show Spaces 21, 22, 31 and 32 Coliseum

The Prest-O-Lite exhibit at the Chicago Show will be of interest to the entire automobile industry—to manufacturers, dealers and car owners.

We cordially invite you to visit our space and inspect the complete line of Prest-O-Lite starting, lighting and ignition batteries for automobiles.

**Dealers** everywhere are realizing larger profits on Prest-O-Lite business today than ever before. If you are unable to attend the Chicago Show, it will pay you to write for our dealer proposition.

The Prest-O-Lite Co., Inc.

U. S. Main Office and Factory, Speedway, Indianapolis, Ind.  
Canadian Main Office and Factory, Merritton, Ontario, Can.

Branches and Charging Plants in all Principal Cities



*Not only a better battery but  
backed by Prest-O-Lite Service*



## Superior By Comparison

It is a known fact that 80% of all cellular radiators today sold in competition are of hexagon construction. You can identify the original by the horizontal cells.

# HARRISON

Original Hexagon

## CELLULAR RADIATOR

This particular construction replaces the square honeycomb type and saves 10 to 30 lbs. of brass, without sacrificing cooling capacity. Insures lighter weight and greater efficiency. If we knew a better type we would make it.

Notice its performance  
on these cars.

CHANDLER—HUDSON—HUPMOBILE  
MITCHELL—OLDSMOBILE—PEERLESS

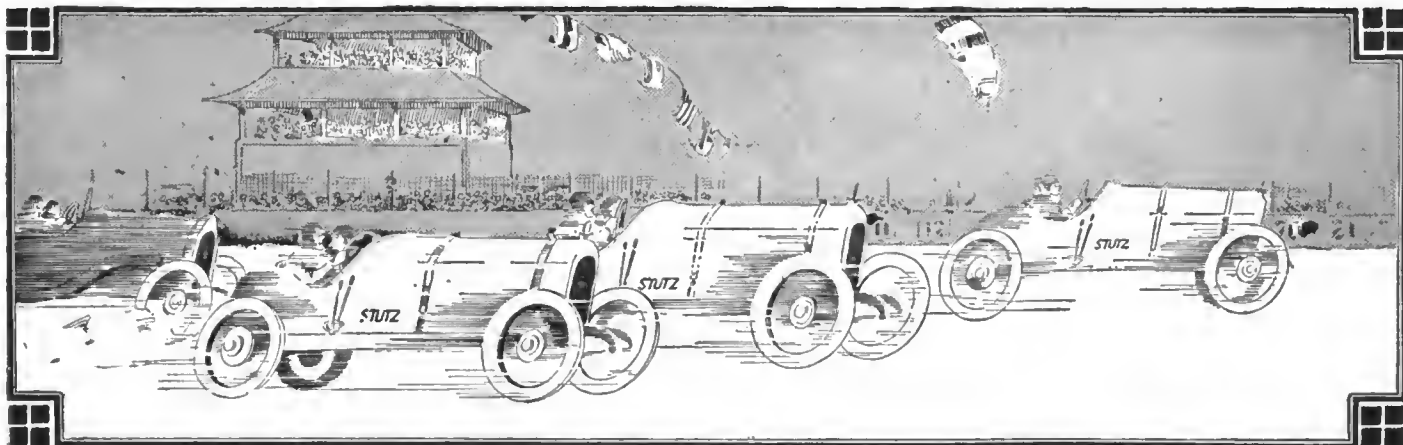
also

GRAMM and FEDERAL TRUCKS

Our book on radiator history  
and efficiency upon request.



The HARRISON MFG. CO., Inc.  
Lockport, N. Y.



**STUTZ Consistency  
Records and Long  
Distance Records  
(for 300 and 350 Miles)  
Have Never Been  
Equalled**

—winner of four **consecutive** firsts and seconds during 1915, a record unprecedented in the annals of racing history.

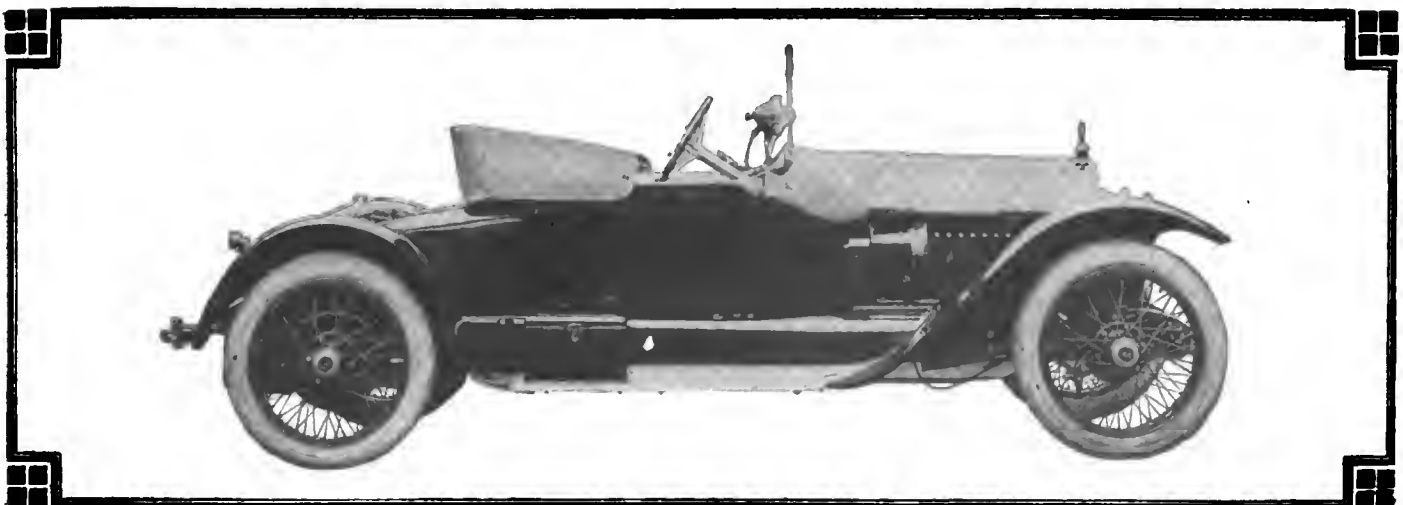
—finisher of the 294-mile Vanderbilt Cup Race on November 16, 1916, at an average speed of 83.74 miles per hour and two days later finisher of the Grand Prize Race at 43 miles at the same average speed, 83.74 m.p.h.—as convincing evidence of STUTZ Consistency as race-goers have ever witnessed. (This performance by private owner.)

—as thoroughly consistent in everyday usage as in the concentrated service test of road and speedway racing.

*See Us at the Chicago Show*

AGENCIES IN ALL PRINCIPAL CITIES

**Stutz Motor Car Company**  
Indianapolis, Indiana, U. S. A.



Please mention The Automobile when writing to Advertisers



Packard



Haynes



Marmon



National



Pathfinder



Sun



Kissel

CUNNINGHAM HALL  
Others Equally Prominent

Super-Efficient Piston Rings



Are Standard Equipment on Leading American Motor Cars

No more sincere nor convincing endorsement of piston ring efficiency than this could be forthcoming. Cars of international reputation are not placing that reputation in jeopardy through acceptance of untried or unproved units.

Nor, in this day of aeroplaning prices, are manufacturers inviting extra expense in furnishing cars with equipment, unless it actually improves car performance, intensifies consumer satisfaction or betters a car's selling qualities.

Dealers—Garagemen—Repairmen

BURD High Compression Piston Rings help dealers, garagemen, and repairmen to render car owners a service of lasting satisfaction—a vital service that pays big dividends in return patronage. Every set of BURD Piston Rings installed sells additional sets. During winter and spring every car you overhaul can be wonderfully improved with BURD Piston Rings. Recommend them—push them! You get the credit. Get in touch with our nearest sales office or write us direct for interesting proposition.

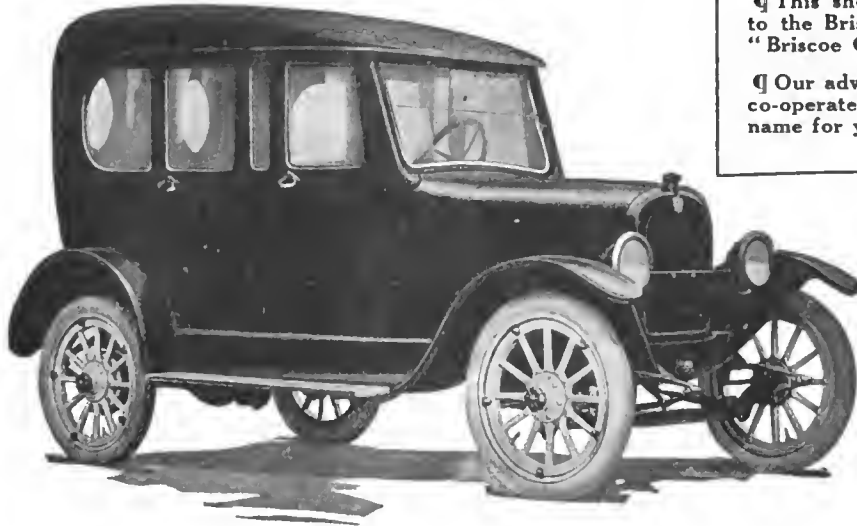
Burd High Compression Ring Company  
ROCKFORD, ILLINOIS

SALES OFFICES

Boston, Mass.....899 Boylston St.	New York City.....1864 Broadway
Buffalo, N. Y.....810 Iroquois Bldg.	Peoria, Ill.....223 Masonic Temple
Chicago, Ill.....1427 S. Michigan Ave.	Philadelphia, Pa.....684 N. Broad St.
Dallas, Tex.....819 Wilson Bldg.	Pittsburgh, Pa.....904 East End Trust Bldg.
Detroit, Mich.....578 Woodward Ave.	Portland, Ore.....816-817 Lewis Bldg.
Kansas City, Mo.....216 Rialto Bldg.	Rochester, N. Y.....558 Lyell Ave.
Los Angeles, Cal.....316-317 Hass Bldg.	St. Paul, Minn.....149 W. Sixth St.
Milwaukee, Wis.....813 Grand Ave.	San Francisco, Cal.....841 Phelan Bldg.
Minneapolis, Minn.....904 Marquette Ave.	Seattle, Wash.....705 E. Pike St.



# Lay Your Plans Now— For Next Season's Closed Car Business!



☐ This shows one of our winter tops fitted to the Briscoe 4-24 model advertised as the "Briscoe Coachaire."

☐ Our advertising department will be glad to co-operate with you in working out a suitable name for your winter model.

## Let's Talk It Over—

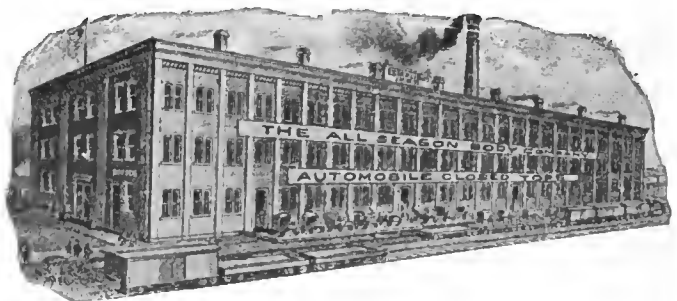
Each year more motorists are driving their cars the year 'round. Every season more and more closed cars and cars that may be fitted with a winter top are in greatest demand. Don't wait until the winter season is at hand and then try to hurry a top to fit your touring model, or to have designed an enclosed body.

Now, while there is ample opportunity to plan and design and fit is the time to get started on your winter body problems. Be ready to "cash in" on closed car sales by having your cars ready for early display.

Our bodies and tops are protected by patents and made by expert workmen—men who were born in the carriage and automobile body business.

In appearance, construction and materials they are the equal of the finest closed or Sedan bodies on sale today.

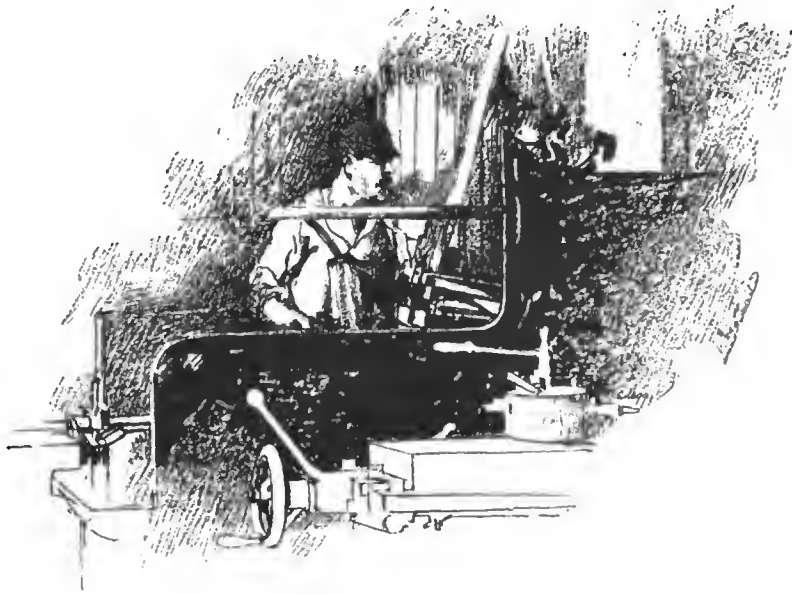
We are contracting now for only such work that we are confident we can make deliveries on, therefore, an early interview is solicited—when may we call?



## ALL-SEASON BODY COMPANY

MARSHALL, MICHIGAN

JACKSON, MICHIGAN



# BROWN-LIPE

THE REASON FOR THE use of Brown-Lipe Transmissions and Differentials by such a large majority of leading Pleasure Car and Truck Manufacturers is not found in any one thing.

IT IS NOT ONLY BECAUSE OF THE UNEXAMPLED accuracy of Brown-Lipe workmanship, not because of our using only the finest steel, nor the unequalled completeness and modernity of our factory equipment; neither is it only because of the extraordinarily helpful *additional* safeguards to longevity and perfect performance that are included in all Brown-Lipe products.

IT IS THE SUM OF THESE THINGS, the surpassing thoroughness, the bottom-deep and brimful quality of every single, individual, Brown-Lipe job, that has elevated Brown-Lipe Transmissions and Differentials to their present commanding position in the Industry

AND THIS MAN—as well as every one of his fellows—knows this, and realizes that Brown-Lipe products must continue to approach as near to absolute perfection as human limitations permit.

## BROWN-LIPE GEAR CO.

SYRACUSE

Transmissions

NEW YORK

## BROWN-LIPE CHAPIN CO.

Differentials

New York: Thos. J. Wetzel, 29 W. 42d St.  
 San Francisco: A. H. Coates, 444 Market St.  
 Chicago: K. Franklin Peterson, 122 S. Michigan Ave.  
 Detroit: L. D. Bolton, 2215 Dime Savings Bank Bldg.  
 Foreign Agent: Benjamin Whittaker, 2 Norfolk Street, Strand, London, W. C.

U

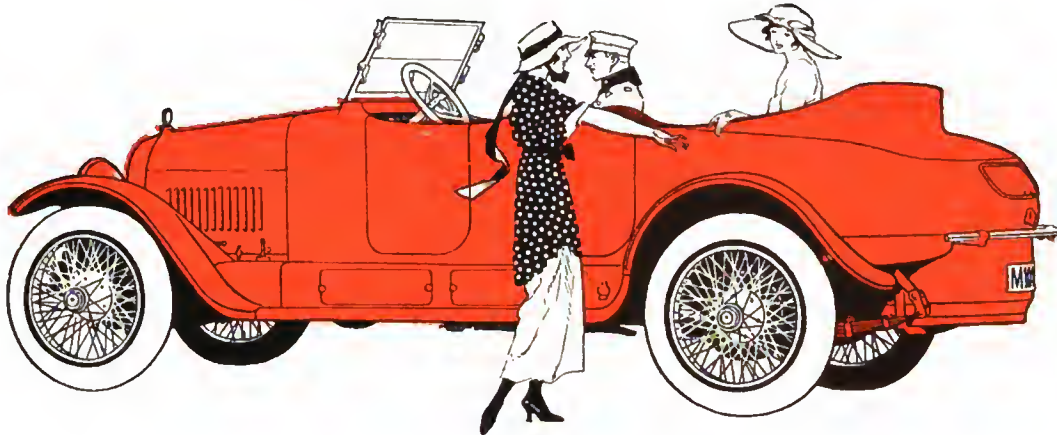




**F**ROM the moment it was first exhibited at the New York Show the new Pathfinder Seven-Passenger Touring Roadster became the most talked-of car in America. In its daring departure from conventional design the Pathfinder arrests attention and carries conviction that here, at last, is a motor car that is really distinguished.

The beautiful body is so expressive of power, fleetness, comfort and safety, the disappearing top and concealed spare wheel and tires so logical, that you are prepared to find a chassis that is a triumph of engineering and a twelve-cylinder engine unequalled for power, flexibility and economy. The new Pathfinder is a car of utmost luxury and refinement. For the dealer the new Pathfinder Seven-Passenger Touring Roadster means prestige as well as profit.

THE PATHFINDER COMPANY  
INDIANAPOLIS, U. S. A.



**I**TS originality of design gives it a special appeal to people of means who seek the new and individual—yet its departures from conventional design are so logical and convincing that even the most conservative will be attracted by their manifest desirability and by the thorough quality of the car as a whole.

The new Pathfinder Seven-Passenger Touring Roadster as the most talked-of car in America, presents a new opportunity for capable dealers to enter successfully into a field hitherto closed to them.

Though the Pathfinder is now represented in a majority of the large cities, we can take care of about fifty additional dealers and shall be glad to present the Pathfinder in detail to dealers where we are not now represented.

THE PATHFINDER COMPANY  
INDIANAPOLIS, U. S. A.



# BOSSERT

## ABSOLUTE DELIVERIES

Over one hundred automobile manufacturers will accept no other than Bossert pressed steel parts. As model after model follows the trend of modern construction, substituting pressed metal parts for bulky and cumbersome castings and forgings, there is an ever increasing demand for Bossert products. Manufacturers have learned that they can depend on

### “THE BOSSERT WAY”

*(If it can be done in pressed metal we can do it.)*

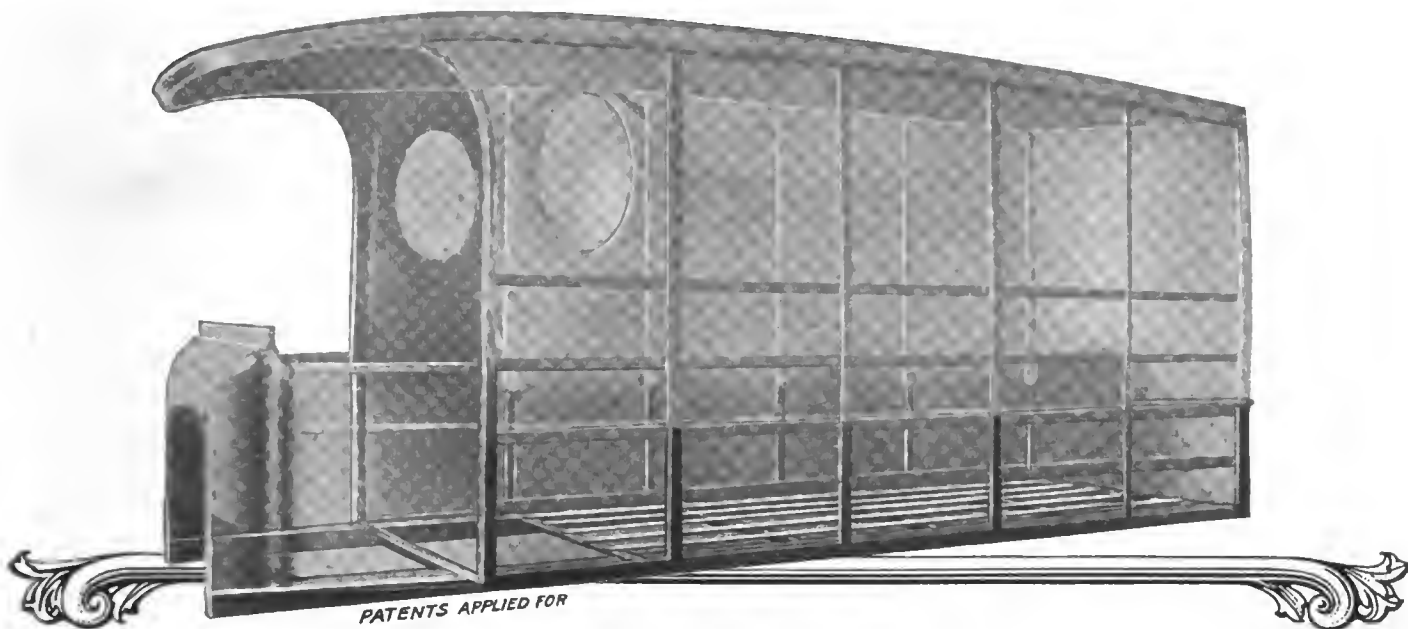
to supply them with their standardized units of construction.

We are specialists in the working and stamping of pressed metal. Our engineers are accepted authorities in this line of work and will gladly co-operate with you to insure the most satisfactory solution of your problems. We have the largest metal presses in the world in splendidly equipped daylight factories with a capacity which will enable us to meet your production requirements with promptness and regularity. We guarantee deliveries, as and when specified.

THE BOSSERT COMPANY . . . . . UTICA, N. Y.



Please mention The Automobile when writing to Advertisers



## LIGHTER-STRONGER-MORE DISTINCTIVE

An X-RAY of a Babcock Body would reveal its skeleton of steel!

Showing through the phantom outlines of this beautiful panel body is seen the light, compact steel frame (fully covered by the Babcock Patents) which adds 2/3 in strength, saves 1/3 in weight, and yet in no way detracts from the external symmetry and finish. Like the human skeleton, its presence is felt unseen.

# BABCOCK

## COMMERCIAL BODIES

No more beautiful bodies are made. Side panels consist of one huge sheet of VEHSOTE—crackless—jointless—flawless. The checking, blistering, the gaping seams, unavoidable in wooden panels, are impossible with this impervious one-piece material.

On this foundation, sheer as polished marble, is applied the finish—12 coats of paint and varnish, brushed on and rubbed to the coach-builder's enduring lustre. 50 years' experience in body-building has made us masters of the art. You do not have to order specially to get this smooth evenness of finish. ALL Babcock Bodies have it.

Nine hundred and ninety-nine others were "laid down" at the same time this body was, all exactly alike. At the same time many other types were being made—a thousand each. The "Unit System," as exemplified in the successful manufacture of motor

cars, is demonstrating the same results in the production of commercial bodies—Quality Goods at Quantity Prices.

Our tremendous quantity production, together with low overhead (ample waterpower, latest efficiency methods, and 12 acres of factory floor space), enables us to sell at prices but little above those you pay for bodies that are not to be compared with these in quality.

DEALERS—Your trade is looking for Lowest Final Cost in Commercial Bodies as well as Chassis. Babcock Bodies represent Lowest Final Cost. They are what buyers want. Let us put you in position to profit by the intelligent demand which the public consciousness of Babcock Reputation and Quality is creating.

*Write Us Today.*

**H. H. BABCOCK COMPANY**  
 WATERTOWN,                      FOUNDED 1845                      NEW YORK.

Please mention The Automobile when writing to Advertisers

# Madame Butterfly

## Portals of Enchantment

**I**N all opera there is no more enchanting music than "Madame Butterfly." The exquisite rapture of "Un Bel di Vedremo," the greatest aria of Puccini's opera, is in itself enough to transport the hearer to the fairyland of Spring in Japan.

The whole enchanted realm of grand opera, with all its splendor and wealth of beauty, comes to life through the magic portals of the

# COLUMBIA GRAFONOLA

Your favorite opera, your favorite aria — your favorite solo, duet or ensemble, sung by world-famed artists of opera, is translated into enthralling *reality* on Columbia Double-Disc Records.

The opera can be a nightly delight, hearing its great voices a joy at your instant call, if you have this greatest of musical instruments with Columbia operatic records in your home.

Hear a Columbia Grafonola at your dealer's today. Prices \$15 to \$350.

*New Columbia Records on sale the 20th of every month.*





# HAYES WIRE WHEELS

Experience, equipment, ample resources, anything and everything that could contribute to and positively assure a worthy product, has been called into play in the manufacture of "Hayes" Wire Wheels. You expect the best from "Hayes"—and you get it. You will see them at the show. Catalog ready now.

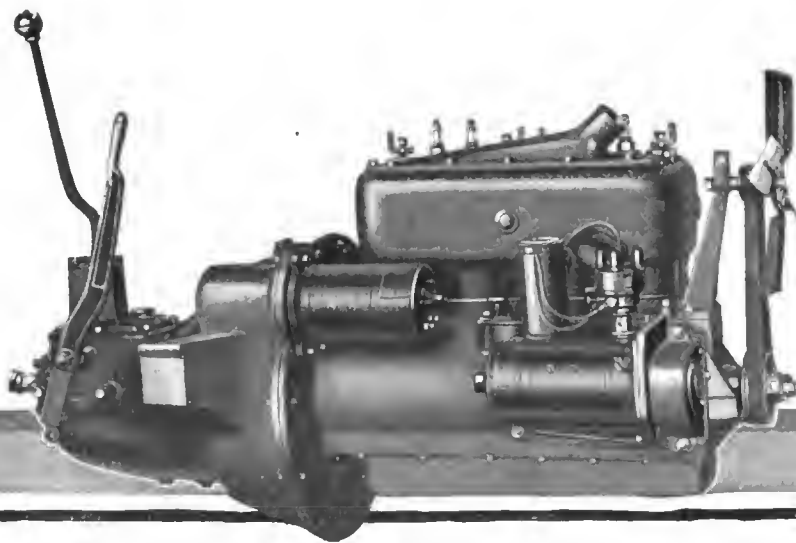
*Exhibited at Chicago*

## Castle & Kyte

*Exclusive Selling Agents*

872 Woodward Ave. Detroit, Mich.

Please mention The Automobile when writing to Advertisers



Four cylinders,  $3\frac{3}{4} \times 4\frac{1}{4}$   
in.,  $22\frac{1}{2}$  hp., A. L. A. M.  
rating. Develops 36.9 hp.  
at 2800 revolutions per  
minute.

## Polished Perfection

A KEEN appreciation of the fact that no motor is fully sold until it reaches and satisfies the car buying public has led us to devote all our skill, resources and manufacturing energies to the production of one type and one size of motor.

Through concentration and specialization on this model—we have virtually bound ourselves to produce a motor that simply **must** excel. We have no other size or model to offer if this does not satisfy. Therefore, as a logical sequence, our sole business is to produce this motor of such quality, such workmanship, such flexibility and such smoothness of operation, such power and durability that it does everything expected of it—and more.

"This one thing we do" is the slogan

of the G. B. & S. organization and its practical result is a four-cylinder motor developed to the point of polished perfection.

**1917 Refinements include:** Shorter intake permitting placing of Carburetor closer to motor, reducing gas friction. New chain adjustment—you can take up all slack quickly while motor is running. Larger Chain. Larger flywheel giving greater starting torque. Larger flywheel housing providing ample room for placing of an inboard starter—any standard make. G. B. & S. motors now provide for 2 unit starting and lighting system exclusively, operating thru Bendix drive.

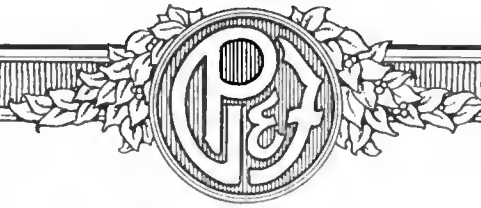
For blue prints and other information write

Golden, Belknap & Swartz Co.

DETROIT, MICH.

**G-B&S**  
**motors**

Please mention The Automobile when writing to Advertisers



# G. P. & F.

18 Gauge



**Radiator Shells, Oil Pans,  
Gear Cover, Gasoline  
Tanks, Mufflers.**

## Deliveries on Time

In your relations with G. P. & F. you are constantly moving forward.

From the time your order is received until your pressed steel parts are delivered, they are continually approaching completion.

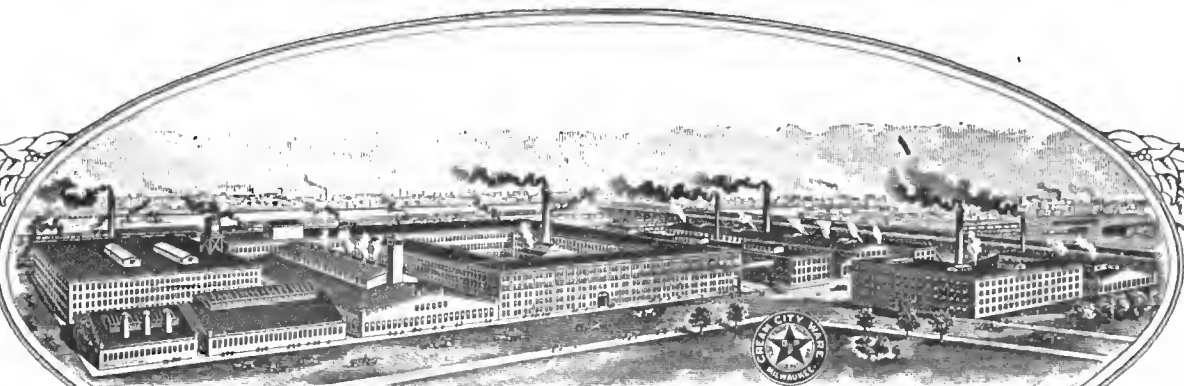
Thirty-four years of successful experience in handling sheet metals—and more than fifteen acres of factory in which to handle it—insure progress from the start and deliveries on time.

And there is other economy besides time in using G. P. & F. Pressed Steel Parts. Send your blue prints or samples for estimates.

### Geuder, Paeschke & Frey Co.

1422-1700 St. Paul Ave.,

Milwaukee



Please mention The Automobile when writing to Advertisers





BUYING  
GOOD  
BRAKE  
LINING

*is like  
buying good  
shoes*

—for both prove their worth through their ability to resist wear in the grind of steady service. But shoes may wear out without actual danger. Quality in Brake Lining is absolutely vital.

GARCO is built to back your good workmanship. It is a firm foundation on which hundreds of dealers are building a reputation for quality work and quality accessories of all kinds. GARCO is solidly woven. It holds with the grip of a giant till the last shred is

entirely gone. For **Safety's** sake, recommend GARCO for every brake lining renewal. When your customer leaves the choice of brake lining up to you, use **GARCO**. Clinch his future business along this line for all time.

GARCO is sold by all Jobbers. Write yours today for our fair-deal proposition. The GARCO Line of Asbestos Auto Specialties is complete. Investigate GARCO Transmission Band Lining for Ford Cars.

## General Asbestos & Rubber Company

MAIN OFFICE  
AND FACTORIES: **CHARLESTON, S. C.**

BRANCHES: 58 Warren St., New York; 311 Water St., Pittsburgh, Pa.; 530 Golden Gate Ave., San Francisco, Cal.

GARCO

Please mention The Automobile when writing to Advertisers



# Get in

## On The Ground Floor

—of quickest starting—smoothest acceleration—  
greatest flexibility—swiftest speed—mightiest  
power and the utmost of fuel economy—that can  
be obtained from your car.

## The New Stromberg Carburetor

—opens wide the way and keeps it open.

It has shattered all records for fuel savings—  
increased mileage—speedy get-aways—and devel-  
opment of **driving force**—over the world's worst  
roads—under **severest** car-killing weather condi-  
tions.

And this performance of promoting **100%** car  
**efficiency**—minimum cost and care of operation—  
**maximum** speed, mileage and power is perpetual.  
The excellence of construction and unfailing  
**accuracy** of operation of the New Stromberg  
assures actual day-after-day delivery of the highest  
known standard of carburetor action—on any car  
under any road or climatic condition.

See it at the Chicago Show and be convinced.

If you do not attend the Show be sure to send  
for interesting information. Give name and  
model of your car.

**Stromberg Motor Devices Co.**

Dept. 118, 64 E. 25th St., Chicago, Ill.

**New STROMBERG Does it!**  
**CARBURETOR**

Please mention The Automobile when writing to Advertisers

# Jackson

*"No hill too steep—  
No sand too deep"*

There is a big demand for the "Wolverine Eight."  
See it at the Chicago Show and you will  
understand why. Get these facts:

The more you know about eights and the more you know about motor cars in general the quicker you will be to appreciate the points that are making the "Wolverine Eight" the most popular and quick-selling car ever built by the Jackson Automobile Company.

We invite your attention to two important factors in this success—the Ferro-Jackson motor, and the pleasing variety of beautifully finished, well-built bodies offered in connection with the Wolverine eight chassis.

The Ferro-Jackson motor is creating an amazing interest in the Jackson car. It is the first American-designed, V-type, eight-cylinder motor with enclosed overhead valves without cages.

It is the first eight as well as the first V-type motor to be cast with both cylinders and upper half of crankcase in one piece.

With a bore of 3 inches and a  $3\frac{1}{2}$  inch stroke it develops more power per cubic inch of piston displacement than any motor ever built up to the present time.

It is rated at 28 h.p. and shows in excess of 50 horsepower on block test at 2800 revolutions per minute.

It is economical to a surprising degree—shows an average of 17.7 miles to the gallon of gasoline on touring tests. Some owners report better than that.

And it is an exponent of the finest type of motor smoothness, flexibility, quick acceleration. It shows surprising freedom from vibration at all speeds.

You will find the body styles up to the minute. You must see them to really appreciate their extra quality.

Five-Passenger Touring Car, \$1295. Four-Passenger Cruiser, including five wire wheels, \$1395. Wood wheels \$100 less. Two-Passenger Roadster, \$1295. Five-Passenger Sedan (Demountable Top), including regular top, \$1505. Seven-Passenger Jackson-Springfield Sedan, 1995. All prices f.o.b. factory.

Dealers: The fifteen-year-old reputation of the Jackson Automobile Company for producing cars of strength, power, comfort and ease of riding is more than lived up to in this new model. Write and learn more of the sales opportunities offered you in the agency for this car.

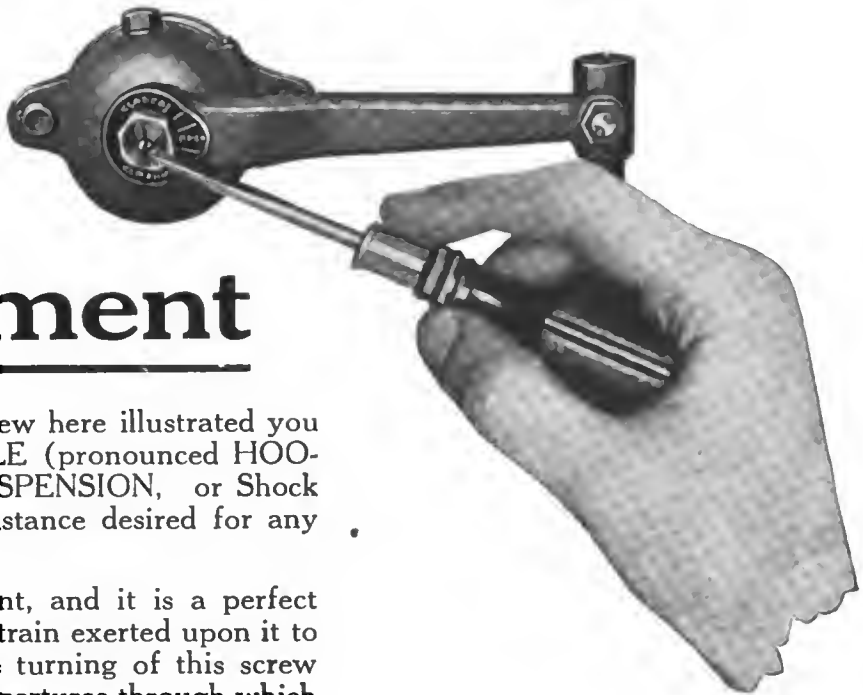
## Jackson Automobile Company

1223 East Main Street, Jackson, Mich.



Please mention The Automobile when writing to Advertisers

# The Only Adjustment



By a slight turn on the screw here illustrated you can adjust the HOUDAILLE (pronounced HOO-DIE) HYDRAULIC SUSPENSION, or Shock Absorber, to the exact resistance desired for any make or weight of car.

That is the only adjustment, and it is a perfect adjustment for there is no strain exerted upon it to weaken or change it. The turning of this screw simply opens or closes the apertures through which Castor Oil is forced by the rotary piston.

# HOUDAILLE

(PRONOUNCED HOO-DIE)

## Hydraulic Suspension

This Hydraulic Recoil Check has only one moving part. It is perfectly simple in construction, and the basic principle of its design is precisely that of the recoil checks that have proved so successful on the big guns now in action on the battlefields of Europe.

It retains its usefulness unchanged the year round, for the viscosity of the oil used (Castor

Oil) is not affected by heat or cold within atmospheric ranges. It contains no springs or frictional discs of any kind.

To attach the HOUDAILLE requires not the slightest change in the body or chassis of the car. There is only one model for all cars, as it is universally applicable and has a practically limitless adjustment.

*We invite exhaustive tests by manufacturers and engineers, at no expense or inconvenience to them. The HOUDAILLE is attached with very little trouble and in a short time. Its demonstration is easy, and its principles immediately understood and appreciated.*

**Houdaille Shock Absorber Company, Inc.**

1737 Broadway, New York

9

**LOZIER**  
THE CHOICE  
OF MEN WHO  
KNOW

## *During the Chicago Show in the Greer Building*

discriminating dealers and discriminating motorists will have the opportunity of viewing a car positively without peer among 1917 sixes—the distinctive, aristocratic, luxuriously appointed

### *Lozier Six \$2775*

No car—domestic or foreign—more closely approaches the ultimate in high price car design—in that marked individuality of performance, construction and the fine bearing of a thoroughbred which enables a car to **dominate** any occasion.

The 1917 LOZIER Six is a monumental achievement. It bears the stamp of prestige. It meets the exacting demands of those who prize exclusiveness—a getting away from the rank and file of common cars. Here is a car which establishes an enviable *standing* in motordom for dealers as well as owners.

Send for handsomely illustrated descriptive catalog.

**LOZIER MOTOR  
COMPANY  
OF DETROIT**

*Dealers: Visit us during  
the Chicago Show, call  
on us at Detroit, or  
write us for one of the  
most attractive business  
building propositions  
ever offered.*



Please mention The Automobile when writing to Advertisers



# The Spotlight of the motoring world is on

## RAYFIELD CARBURETORS

There are more than 600 Rayfield Service Stations in principal cities and towns of the United States.



Special Exhibits at the Chicago Show at Coliseum and at Chicago Branch

1140 Michigan Ave.

Open house at both exhibits—you'll be welcome and interested.

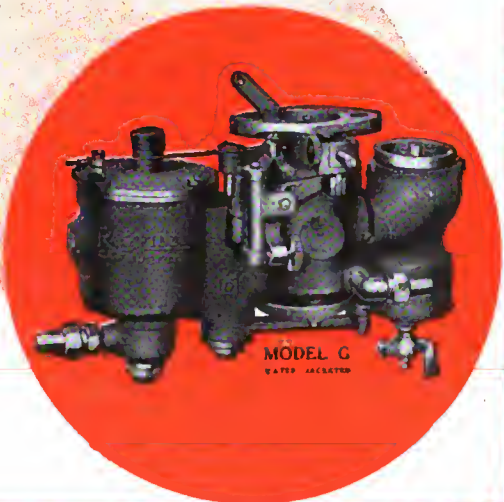
**Findeisen & Kropf Mfg. Company**  
2117 Rockwell Street, Chicago

The **Guarantee** is *unconditional*. *The Rayfield must prove itself in every way a better carburetor than the one you have—and prove it to your satisfaction—if not, full purchase price will be returned. You have thirty days to decide.*

—and their performance:

More flexible—greater range of power—save from 20 to 50 per cent in fuel. Quicker pick-up and starting—more power in climbing.

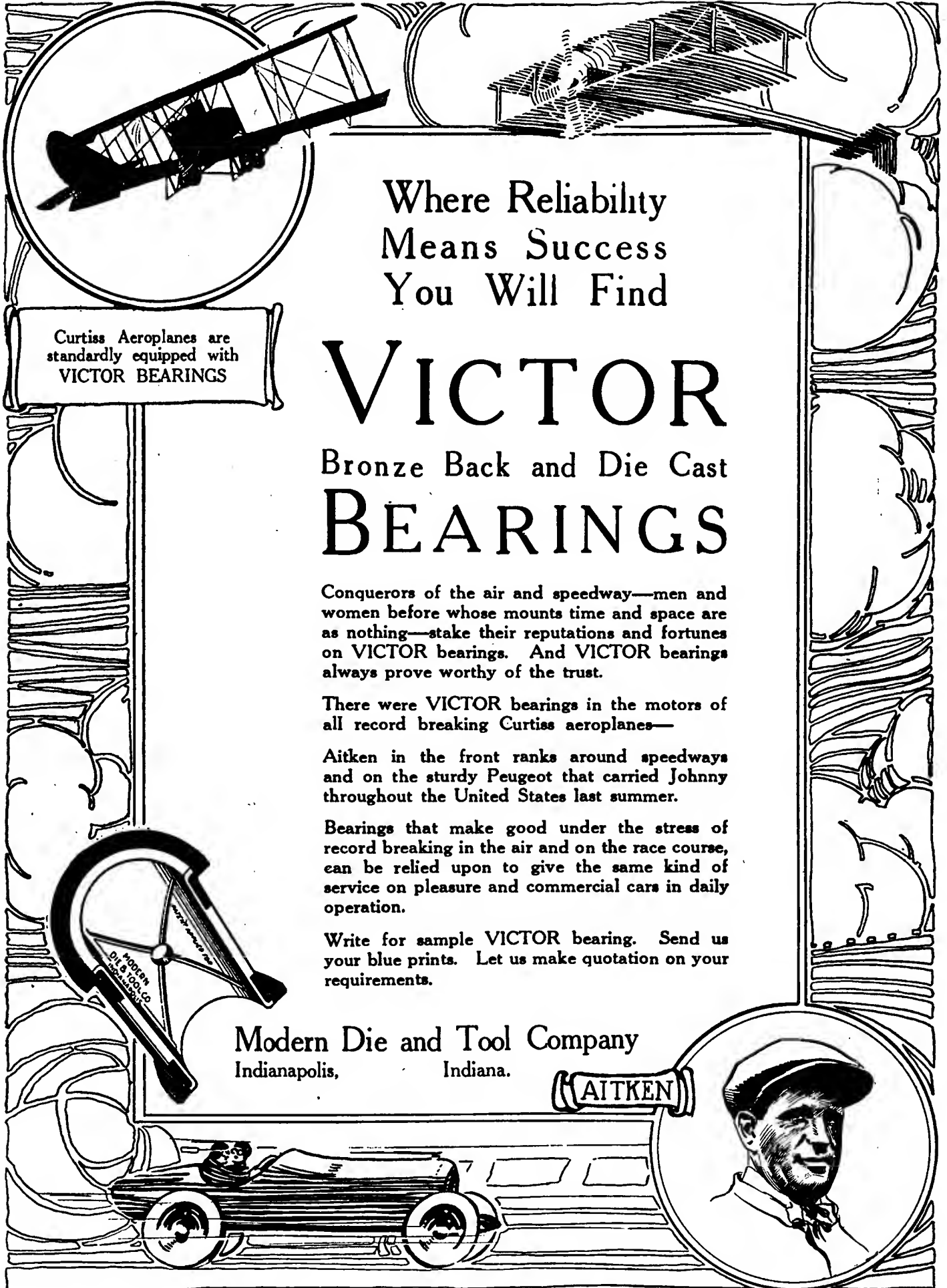
A better carburetor for better cars.



1140 Michigan Ave.  
CHICAGO

BRANCHES:

1902 Broadway  
NEW YORK



Curtiss Aeroplanes are  
standardly equipped with  
VICTOR BEARINGS

Where Reliability  
Means Success  
You Will Find

# VICTOR

Bronze Back and Die Cast

# BEARINGS

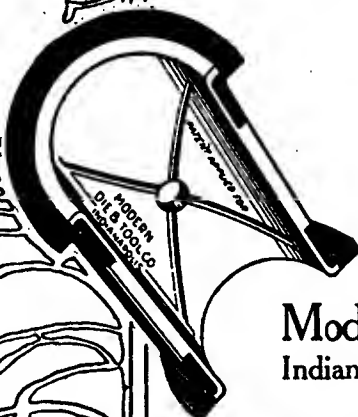
Conquerors of the air and speedway—men and women before whose mounts time and space are as nothing—stake their reputations and fortunes on VICTOR bearings. And VICTOR bearings always prove worthy of the trust.

There were VICTOR bearings in the motors of all record breaking Curtiss aeroplanes—

Aitken in the front ranks around speedways and on the sturdy Peugeot that carried Johnny throughout the United States last summer.

Bearings that make good under the stress of record breaking in the air and on the race course, can be relied upon to give the same kind of service on pleasure and commercial cars in daily operation.

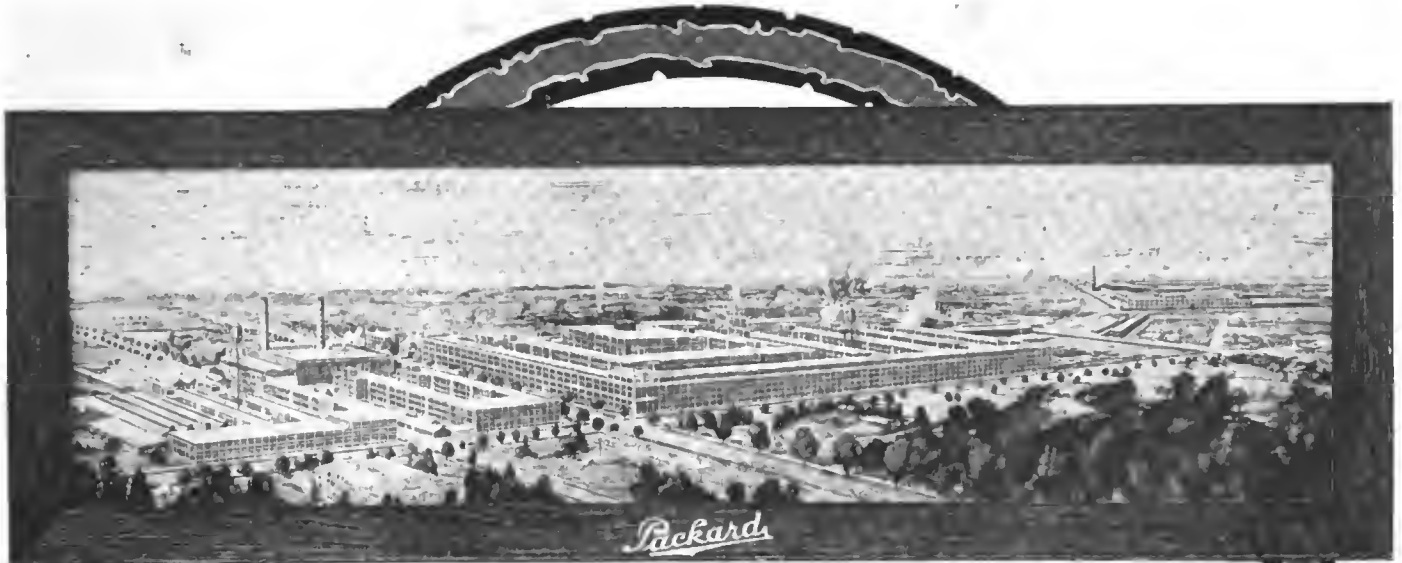
Write for sample VICTOR bearing. Send us your blue prints. Let us make quotation on your requirements.



Modern Die and Tool Company  
Indianapolis, Indiana.

(AITKEN)





## DISTRIBUTE REAL OIL PAINTINGS LIKE THESE TO YOUR DEALERS

Made in relieved oil paint colors, including the thick daubs of oil paint like the original, they are invariably taken for original oil paintings. Each one on artists' canvas mounted on Keyed stretchers. Made in any size. Original size of the PACKARD is 12x43 inches—the OLDSMOBILE and HOUK WIRE WHEEL paintings, 24x34 inches.

## MEYERCORD OIL PAINTINGS ON CANVAS

Commend themselves at once to the manufacturer desiring distinctive display advertising. In a word, they are oil paintings produced in quantities. Dealers regard them as highly as oil paintings. They command preferred display space and are permanent advertising. Light in weight and inexpensive to ship. No breakage.

Factory bird's-eye views made by our patented process cost no more than framed black and white photographs purchased in quantities. We also originate Oil Paintings like the OLDSMOBILE and HOUK WIRE WHEEL subjects.

**THE MEYERCORD COMPANY**  
CHICAGO



Before investing in ordinary display advertising for your dealers learn more about MEYERCORD OIL PAINTINGS. Get prices and see samples.



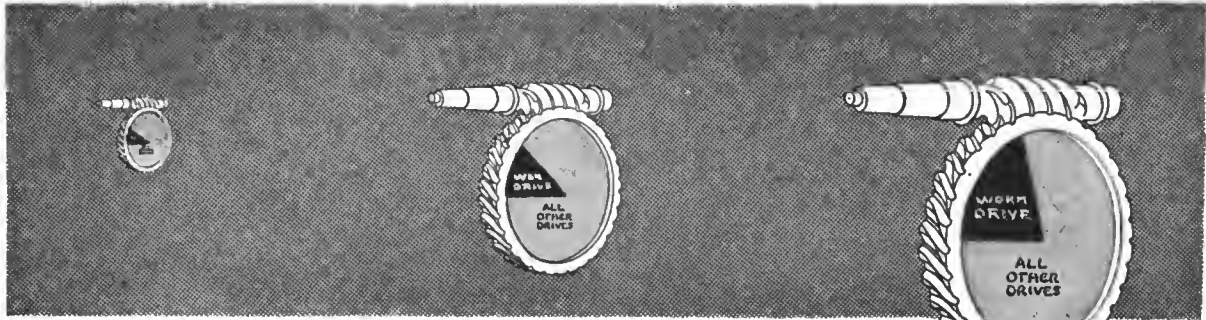
Please mention The Automobile when writing to Advertisers



1913

1914

1915



### Worm Gear Continues to Increase

FOR 1917 almost a 50% increase in the use of worm gear has been registered, according to the accepted statistics as compiled from manufacturers' reports. This brings the percentage of worm gear models for 1917 up to 61½%, with five other methods of drive dividing the balance.

¶ It should be noted that this is a percentage of models produced—rather than trucks actually produced—the only fair way to estimate, as the other method, that of actual number of trucks produced, will show an even larger percentage in favor of worm gear.

# SHELDON

¶ Chain drive has fallen from 79% in 1913 to 69% in 1914, 59% in 1915, 33% in 1916 to 20% in 1917.

¶ The internal gear rose from 1% in 1913 to a little over 12% in 1916, but this year it drops off to less than 10%.

¶ In this same length of time the worm gear has risen steadily from 1% in 1913 to 61½% in the coming year.

*In other words the marked superiority of the worm and gear as a type of final drive is so thoroughly recognized that nothing can stop its progress and dominancy.*

### THE SHELDON AXLE AND SPRING COMPANY

Licensed under the Kardo patents.  
Makers of Springs and Axles for More Than 50 Years

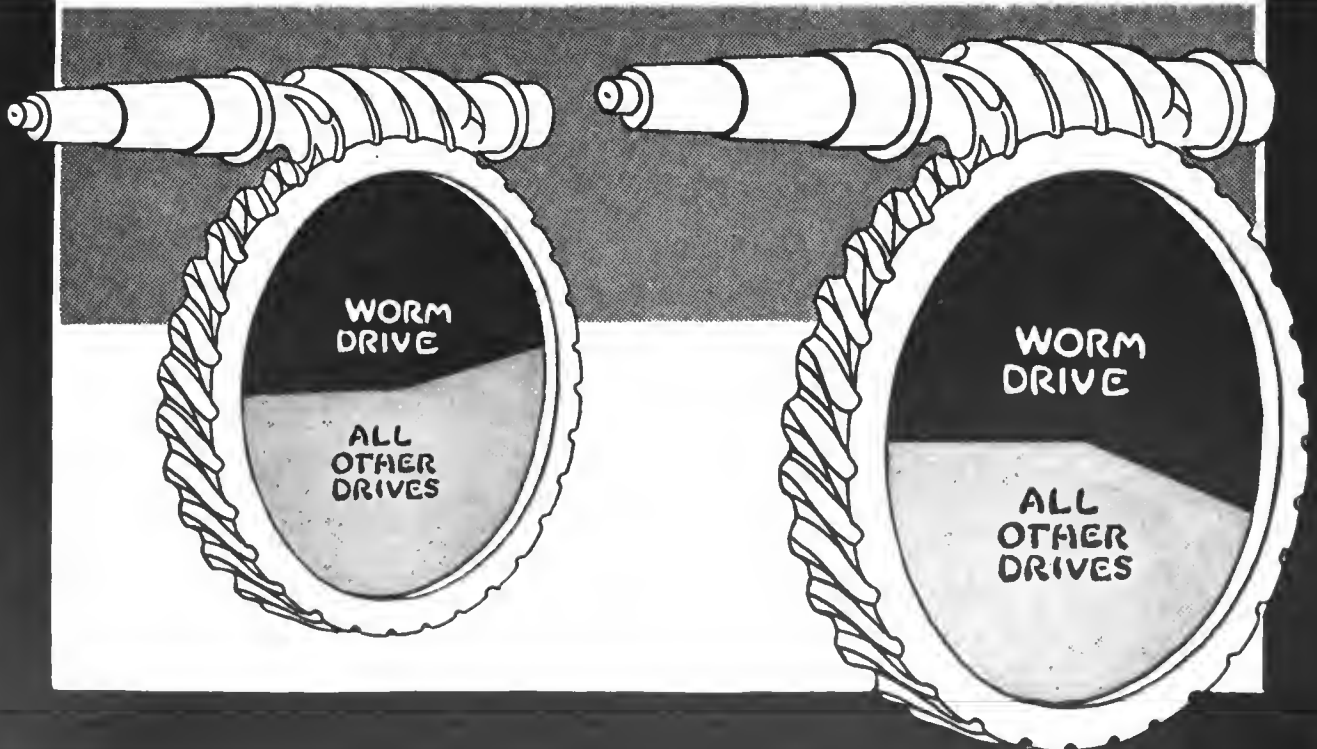
WILKES-BARRE  
Chicago: 122 S. Michigan Blvd.

Detroit: 1215 Woodward Avenue

PENNSYLVANIA  
San Francisco: 444 Market Street

1916

1917



Please mention The Automobile when writing to Advertisers



*"America's Greatest 'Light Six'"*

# HAYNES

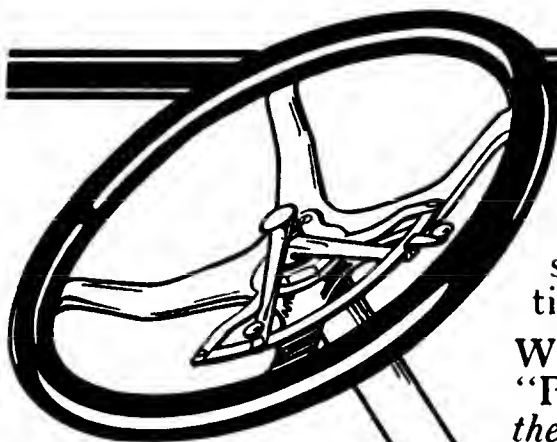
*"America's Greatest 'Light Twelve'"*

*See Us At the  
Chicago Show,  
Space C-4*

**The Haynes Automobile Co.**  
3 S. Main Street    KOKOMO, IND.

THE dealer who signs a  
HAYNES contract  
signs an insurance policy  
against future dull business.

HAYNES Service—  
HAYNES national and  
local advertising—  
HAYNES Prestige of 24  
years' standing—reduce the  
HAYNES dealers' selling  
effort—increase his ultimate  
measure of success.



# Let "PERRY" Lock Your Car

With the "Perry" on your car it can never be stolen. For no auto thief ever succeeded in getting away with a car that was "Perry" Locked.

Why? Because it simply cannot be done. Let "Perry" lock your car and you will always *find it* there when you return.

**Insist on having one installed on your new car**

# "PERRY"

## The Only Lock That Thieves Can't Beat

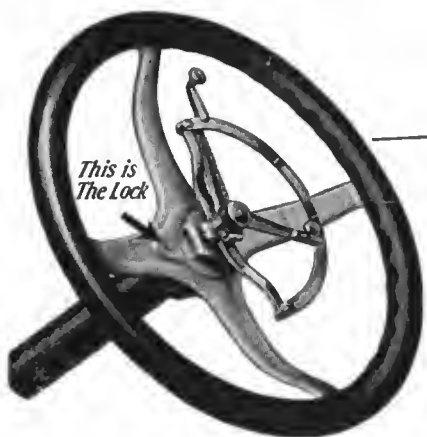
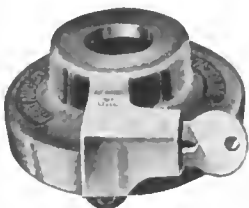


Illustration above shows the "Perry" lock for cars other than Fords. Attached to any car in 15 minutes. Positive action—absolutely safe to drive. Does not interfere with standard parts of steering gear.

**For Fords—\$5**

The "Perry" lock for Fords replaces the standard cap on the planetary housing. Absolutely prevents theft and saves its cost in insurance rate every year.



When you turn the key and remove it, from the lock—the steering wheel spins free. It has no connection with the front wheels of the car. The car cannot possibly be steered, so of course it cannot be towed or driven away. Your car is more safe than if you had lifted the steering wheel entirely off the steering column and had carried it into the house with you.

### SAVE 15% INSURANCE!

This is the only lock on the market, according to insurance experts, that can't be beaten by thieves. It positively cannot be broken or picked. And the result is you can get a reduction of at least 15% on your insurance by installing the "Perry."

You can install it yourself—or our dealer will install without extra charge. Full directions come with each "Perry" lock and full satisfaction is guaranteed under all circumstances.

**PERRY AUTO LOCK CO.**  
Dept. G-4, 1240 Michigan Blvd., Chicago

What if your car were stolen tomorrow? Hundreds of cars will be—and you are just as liable to be the loser as your neighbor.

Could you get enough money out of your insurance to buy another car as good?

Why not make the loss of your car absolutely impossible—by letting "Perry" lock it? The cost is but a mere trifle compared to your probable loss. And the saving in insurance rates will pay for your "Perry" very quickly.

### MAIL THE COUPON!

Don't wait until your car is stolen before you wake up to your danger. Get a "Perry" now and you can forget about automobile thieves forever.

Even if you are not ready to buy, it will pay to find out about "the only lock that thieves can't beat." Mail the coupon to-day.

Mail the coupon at once for full description—prices and name of nearby dealer. Your car may be the next one stolen.

### "I want to know" coupon

Perry Auto Lock Co.,  
Dept. G-4, 1238 Michigan Blvd., Chicago, Ill.

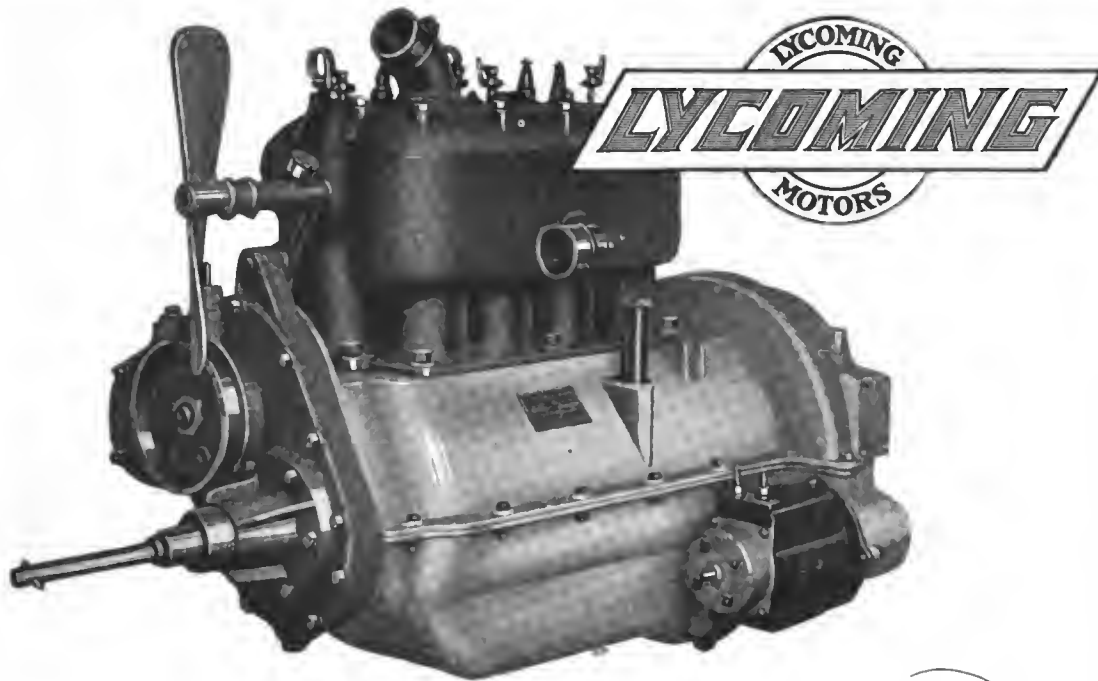
Gentlemen:

I own a ..... car.  
I want to know more about the "Perry" Auto Lock—send me descriptive Folder and give me name of nearest dealer—no obligation on my part.

Name .....

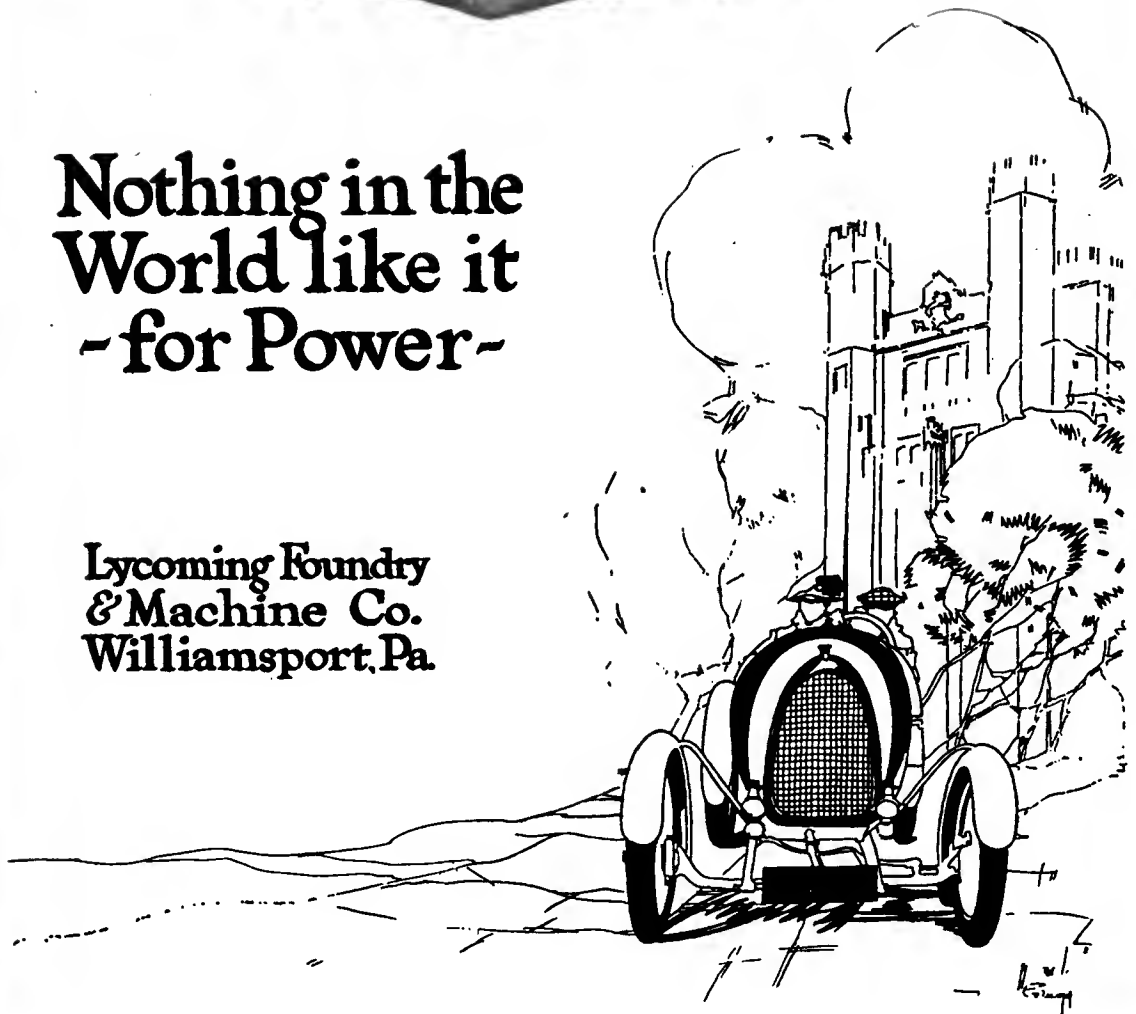
Address .....

Please mention The Automobile when writing to Advertisers



**Nothing in the  
World like it  
- for Power -**

**Lycoming Foundry  
& Machine Co.  
Williamsport, Pa.**



Please mention The Automobile when writing to Advertisers



Here are some of the many types of springs made in plants of The Western Spring & Axle Co. Although they differ in design, size and chemical composition, they have this in common, that all are scientifically heat-treated and have in highest degree the qualities required for the particular service each is to perform.

The Western Spring and Axle Company  
Cincinnati                      Detroit

QUALITY

SERVICE

Please mention The Automobile when writing to Advertisers

**WARNER**  
"THE RECOGNIZED STANDARD"

*Always  
a Sign of Quality  
in the Motor Car*



**TRANSMISSIONS  
DIFFERENTIALS  
STEERING GEARS  
CLUTCHES  
CONTROLS**

**WARNER GEAR COMPANY  
MUNCIE, INDIANA.**

# FIRST PAN- AERONAUTIC

HELD UNDER THE  
THE AERO CLUB  
THE PAN-AMERICAN AE  
THE AMERICAN SOCIETY OF

# GRAND CENT NEW YO FEBRUARY

Military representatives of practically every country of the world will visit the Exposition to see what the American Aeronautic industry is producing.

Congress has appropriated close to \$20,000,000 for aerial defenses. The aeronautic business in this country for the coming

**PAN-AMERICAN AERONAUTIC EXPOSITION**  
**ADMISSION 50 CENTS**

# AMERICAN EXPOSITION

AUSPICES OF  
OF AMERICA  
AERONAUTIC FEDERATION  
AERONAUTIC ENGINEERS

## GRAND PALACE

NEW YORK CITY

### 8 to 15, 1917

Expenditures for the next twelve months will amount to about \$50,000,000.

Engineers, technical men and others will welcome this opportunity of seeing just what this country is doing in aeronautics.

Address all communications to  
HOWARD E. COFFIN, Chairman

OFFICE, 297 MADISON AVENUE, NEW YORK

Telephone Murray Hill, 71-72



# PARK INTEGRALLY COUNTERBALANCED

(Patent Applied for)



"Quick Get-Away." Higher R. P.M. Smoother running motor. Reduced vibration. Eliminated bearing troubles.

We have shipped 32,585 Counterbalanced Crankshafts to January 18th, 1917.

**The Park Drop Forge Co.**  
Cleveland

## THE MOTT WHEEL WORKS

OLDEST RIM MAKERS IN AMERICA

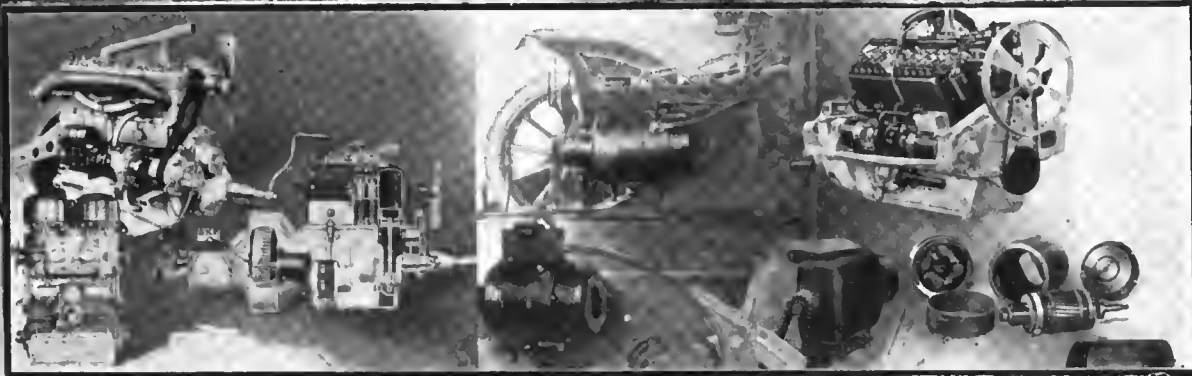
*Manufacturers of* CLINCHER RIMS,  
WIRE WHEELS, STEEL BICYCLE  
AND MOTORCYCLE RIMS

*Satisfactory Service Guaranteed*

**THE MOTT WHEEL WORKS, UTICA, N. Y.**

**SKF**

**B A L L  
B E A R I N G S**



**MAKING THE MOTOR DEPENDABLE**

What kind and what quality of bearings are used does not concern the assembler. To him, a ball bearing, its installation and adjustment are mere incidents in a day's work.

But it means vitally more to you—for it is the kind and quality of the bearings that go into your car's motor, transmission, axles and auxiliary equipment that keep it on the road.

No motor is any better than its bearings—no better than its main shaft bearing—no better than its secondary bearings. And for

the reason that the friction of one bearing is as important as the function of one many times as big and as prominent, it never pays to accept any bearing short of the best.

*S K F Ball Bearings* are made of Swedish Crucible Steel and their double row of balls in staggered relation insures not only strength and endurance beyond the capacity of the average type and kind, but the degree of exactitude to which each detail of their manufacture is carried, underwrites "*Quality and Service.*"

HARTFORD

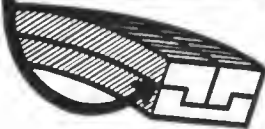
**SKF BALL BEARING CO.**

CONN.



**Beware of Imitations**

The right-angle interlock is your safeguard



This perfect three-piece construction justifies the name—EVER-TIGHT. Note how accurately the right angles fit together. Engineers and Engine Builders acknowledge that this is the only proper construction for safety and prevention of leakage.

**Insist On Ever-Tight**

**PISTON RINGS**

**Keep ALL the Power INSIDE Your Cylinders**

The power you lose through leaky cylinders does not help your engine along at all. Yet it costs you money.

Install Ever-Tight Piston Rings and save this valuable power.

Ever-Tight Piston Rings are made especially for leaky cylinders. They are guaranteed to give compression in out-of-round cylinders as well as in true ones. You do not have to re-bore worn cylinders—Ever-Tight will fit them. They increase compression and decrease friction, giving them 15% to 25% more power. Ever-Tight Pis-

ton Rings are the greatest gasoline savers and practically eliminate carbon troubles.

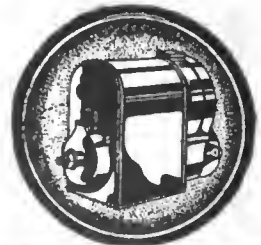
You can make automobiling a pleasure and your truck service a paying proposition by installing Ever-Tight Piston Rings, the only perfect three-piece piston ring on the market. It is the leader.

Motorists everywhere are enthusiastic users of Ever-Tight Piston Rings. Why not install them in your car?

For sale by all dealers.

**EVER-TIGHT PISTON RING CO.,** 1428 Chestnut Street  
St. Louis, Mo.

**EISEMANN**  
MAGNETO



# NABOB

## THE TIRE OF DESTINY

6000 Mile Guarantee. Epoch Making in Tire Construction

**N**ABOB QUALITY is built to satisfy an IDEAL—not to meet a PRICE. The NABOB tire gives birth to a new standard in the tire industry and holds a like position in this line of endeavor as that which the Rolls-Royce—Simplex—Lancia—De Dion Bouton occupy in motor car building.

Made in East Palestine, Ohio, by  
The East Palestine Rubber Company

Executive Offices:  
Pittsburgh, Pa.

### ANNOUNCEMENT TO OUR DEALERS

**W**E announce that contract has been let with W. C. Owen & Company of Cleveland, Architects and Engineers, for immediate construction of model plant adjoining our present buildings, 400 ft. x 54 ft. On completion capacity will be five hundred tires daily.

### TO CONSUMERS

The NABOB Economic Tire Plan is an Economic Evolution—woven in the fabric is an economic principle—its essence is the division of tire maintenance cost—it is a mathematical certainty—to doubt it would be to doubt arithmetic.

Without obligation send particulars regarding proposition referred to.  
Name .....  
Street .....  
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Size of tire .....

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Blackmore Door Curtain Openers give you all the advantages of a car enclosed in wood or glass. When curtains are attached, they enable you to open your doors all the way up. No buttons to fuss with, no curtains to bother you. No "ducking" or stooping to enter or leave the car. These patented Blackmore Openers are simple inexpensive

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The Old Way

### - BLACKMORE - DOOR CURTAIN OPENERS

DON'T PUT UP YOUR CAR THIS WINTER  
TAKE IT TO YOUR NEAREST TOP MAKER

and have Blackmore Openers attached in an hour's time

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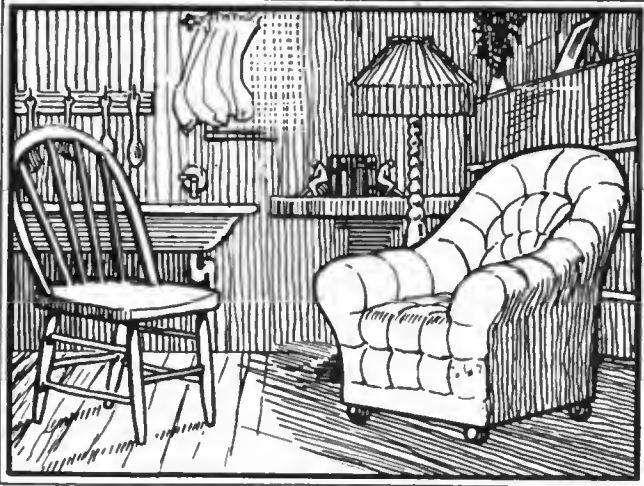


With the Blackmore Door Curtain Open

## DAYTON TOP IMPROVEMENT COMPANY, DAYTON, OHIO

PATENT NOTICE: We control basic patents on door curtain openers, and will vigorously prosecute any infringers

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**CAN YOU PICK COMFORT WHEN YOU SEE IT?**

It's easy to recognize comfort—and the absence of it—in the familiar figures of the kitchen chair and the over-stuffed, though both of them are chairs.

**W & C**

**The Original Double Arm Shock Absorber for Fords**

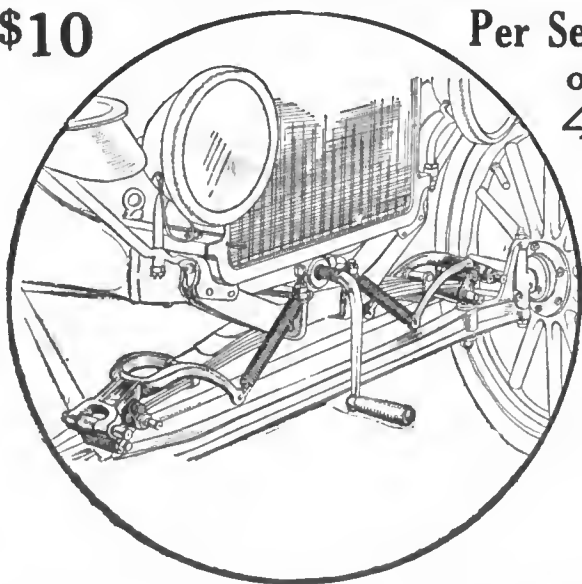
—“over-stuffs” your Ford. Pads out all the roughness and makes it ride like the deep upholstery on your favorite easy chair. Say “W & C” to your dealer, and get that comfort in your Ford. Better than the best riding sensation you can expect from your car until you try W. & C. Do it today.

Specially Interesting Dealers' offer. WRITE FOR DETAILS.

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For Your Boy, Yourself, Your Chauffeur

Consists of

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**DYKE'S AUTOMOBILE INSTRUCTOR \$12.95**

Consists of all the above but without examinations and instead of course being divided into four books, it is bound into one book: the Auto Encyclopedia.

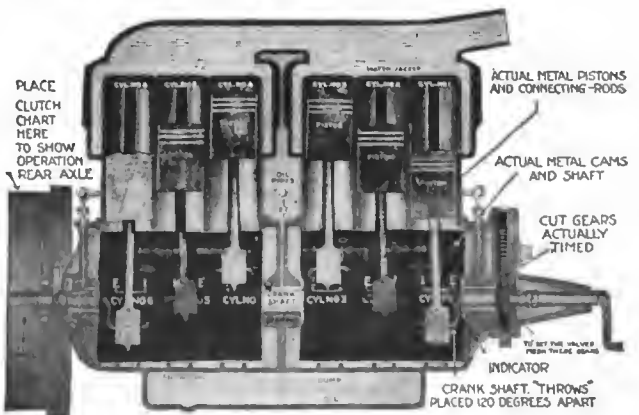
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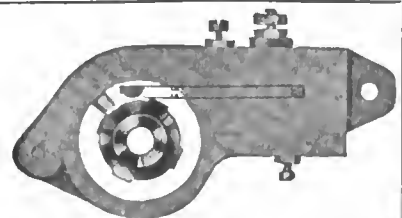
The contact is firm and certain, but of such short duration that current consumption is exceedingly small, although ample to produce hot sparks at speeds greatly in excess of the highest engine demand.

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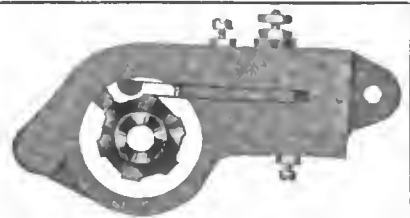
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**PITTSFIELD SPARK COIL CO., PITTSFIELD MASS.**

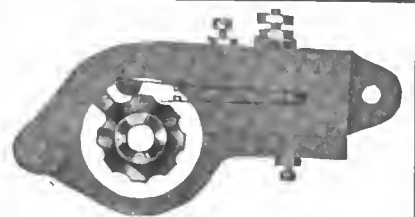
4-cylinder model, showing lower point being lifted into contact.



6-cylinder model, showing points in contact.



8-cylinder model, showing upper point lifted out of contact.





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PLEASURE CAR  
AND  
HEAVY DUTY  
SERVICE

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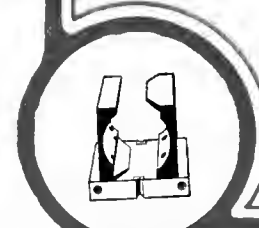
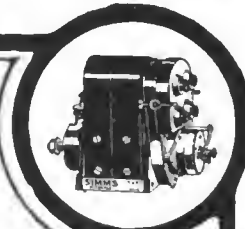
The patented pole shoes used in

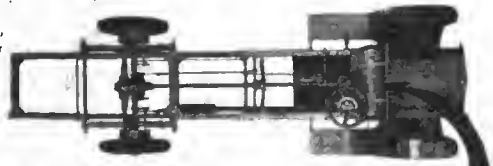
## HIGHTENSION SIMMS MAGNETOS

account for their ability to generate the most intense spark at low speeds in the retard and in the advance at high. One reason for their flexibility and surplus power producing spark.

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# AC

*The Standard Spark Plug of America*

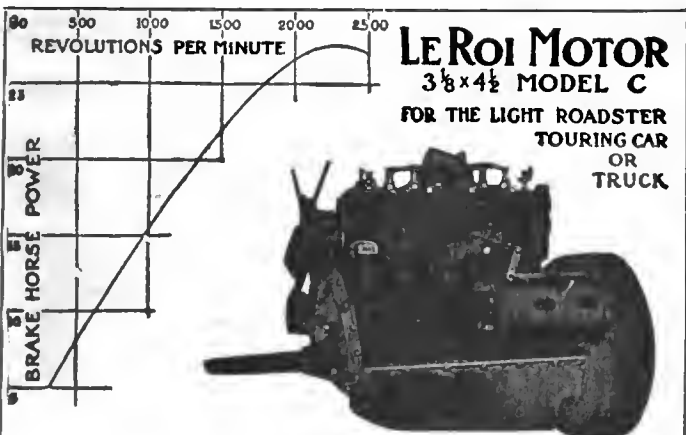
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is reliable—every championship race of 1916 was a Bosch Magneto Victory—every one. You can have that same reliability of ignition by simply insisting on Bosch.

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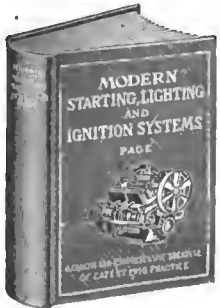
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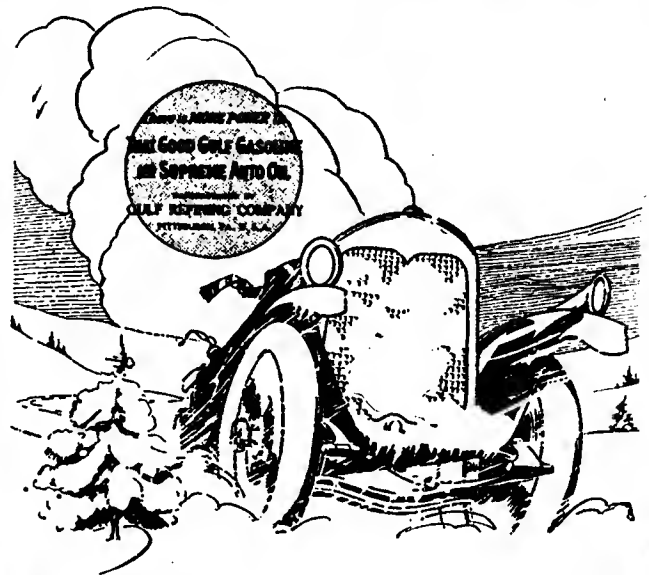
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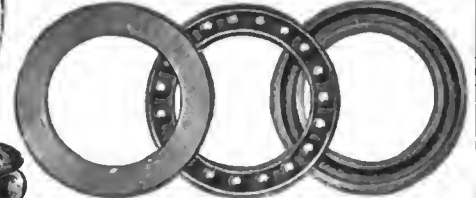
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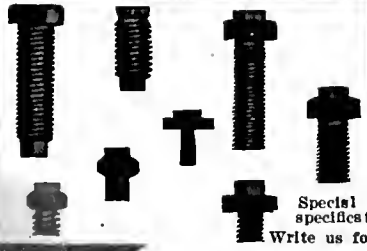
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32 x 3 1/2	9.00	2.50	35 x 4 1/2	17.00	4.15
34 x 3 1/2	9.50	2.55	35 x 4 1/2	17.50	4.25
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32 x 3 1/2	5.25	1.50	35 x 4 1/2	8.00	1.80
34 x 3 1/2	5.50	1.50	36 x 4 1/2	8.25	1.85
31 x 4	6.25	1.65	37 x 4 1/2	9.50	1.90
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with special equipment, assuring absolute accuracy.  
**NEW PISTONS**  
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High compression and plain.  
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at the following prices:

	Plain	Non-Skid	Plain	Non-Skid
28x8.....	\$ 5.88	\$ 6.57	\$13.14	\$14.73
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32x3 1/2.....	9.09	10.17	18.93	21.21
32x4.....	12.33	13.88	28.45	26.28
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Send 10% with order, balance C. O. D. subject to inspection.

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30 by 3 1/2.....	8.70	2.25
32 by 3 1/2.....	9.40	2.50
34 by 3 1/2.....	10.50	2.55
30 by 4.....	8.20	2.90
32 by 4.....	12.85	3.10
34 by 4.....	13.25	3.25
36 by 4.....	13.75	3.85
35 by 4.....	14.50	3.35
36 by 4 1/2.....	16.50	3.55
34 by 4 1/2.....	16.90	3.95
35 by 4 1/2.....	16.70	4.10
36 by 4 1/2.....	17.25	4.25
37 by 4 1/2.....	18.50	4.25
35 by 5.....	17.25	4.30
36 by 5.....	17.75	4.50
37 by 5.....	22.50	4.85
37 by 5 1/2.....	26.75	5.10

## 10% more for non-skid

Owing to the steady advance of the Rubber and Tire Markets we earnestly recommend that you send us your order at once, as we will not be able to sell our high quality goods at prices quoted in this advertisement much longer.

Used tires and tubes taken directly from automobiles we wreck for their parts, **EASILY CAPABLE OF GIVING AT LEAST 1500 MILES SERVICE.**

	Tires	Tubes
30 by 3.....	\$3.50	1.25
30 by 3 1/2.....	4.25	1.35
32 by 3 1/2.....	5.25	1.40
34 by 3 1/2.....	5.50	1.50
31 by 4.....	6.25	1.70
32 by 4.....	6.75	1.60
33 by 4.....	7.25	1.65
34 by 4.....	7.75	1.70
35 by 4.....	7.25	1.75
36 by 4.....	7.50	1.65
34 by 4 1/2.....	7.75	1.50
35 by 4 1/2.....	8.25	1.65
36 by 4 1/2.....	8.35	1.70
37 by 4 1/2.....	8.75	1.80
38 by 4 1/2.....	9.75	2.25
35 by 5.....	8.25	1.85
37 by 5.....	9.75	2.00
39 by 5.....	10.50	2.50

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AN ASSORTMENT OF FISK-BOLTED-ON TIRES IN STOCK. WRITE FOR PRICES. Shipments made promptly SUBJECT TO YOUR INSPECTION upon receipt of one dollar or deposit sufficient to cover express charges; balance C. O. D.

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for big, low cost mileage. They save you 65%. We build splendid double thickness tires by special process, giving you the unusual strength and resistance qualities so essential for heavy work in the country.

Three years ago we introduced DOUBLE TREAD TIRES to the farmer. Square dealing, honest values and prompt delivery have built the largest retreaded tire business in America around our "Doutrè" trade mark. Compare these prices on tires and tubes. Send for booklet and detailed lists.

Sizes	Tires Plain	Red 9 Ply Tubes
30 x 3	\$4.50	\$3.00
30 x 3 1/2	6.00	3.60
32 x 3 1/2	6.25	3.65
34 x 4	7.75	5.00
34 x 4 1/2	9.50	6.60
35 x 4 1/2	10.00	6.75
36 x 4 1/2	10.00	6.90
37 x 5	12.00	8.20

All Sizes from 28 x 3 to 38 x 5 1/2 in Stock.

Tires, Fisk, Red and Gray Tops, 2nd's. Special Prices.

20% Deposit Required on C. O. D.

**DOUBLE TREAD TIRE CO., Inc.**  
102 West 52nd Street New York City

# TIRES

## Akron Tires at Cut Prices

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Size	Plain	Non-Skid	Tubes
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30 x 3.....	5.50	\$6.75	1.90
30 x 3 1/2.....	6.95	7.50	2.15
32 x 3 1/2.....	7.95	8.75	2.25
34 x 3 1/2.....	8.85	9.75	2.35
31 x 4.....	9.85	10.00	2.95
33 x 4.....	9.85	10.85	3.10
34 x 4.....	9.95	10.95	3.20
36 x 4.....	10.95	11.95	3.35
35 x 4 1/2.....	12.95	13.95	4.10
36 x 4 1/2.....	13.50	14.50	4.15
37 x 5.....	15.95	16.95	5.05

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We Double Tread your old tires and guarantee perfect satisfaction. Give us a trial.  
For recovery, 80x5.....\$4.00 80x3 1/2.....\$4.50  
84x4.....\$6.00  
Non-Skid 10% Extra.  
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## TIRES—TUBES

Fresh Selected Stock—Standard Makes Guaranteed

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30x3	8.50	2.00
30x3 1/2	3.00	2.25
31x3 1/2	3.50	2.50
32x3 1/2	9.00	2.50
34x3 1/2	9.50	2.55
35x3 1/2	10.75	2.75
31x4	11.75	2.90
32x4	12.50	3.20
33x4	12.75	3.25
34x4	13.25	3.35
35x4	13.50	3.45
36x4	14.00	3.50
34x4 1/2	16.25	4.00
35x4 1/2	17.00	4.15
36x4 1/2	17.50	4.25
37x4 1/2	18.00	4.35
35x5	17.50	5.00
36x5	18.50	5.00
37x5	20.00	5.20

Add 10% for non-skid.

### Bargains in Slightly Used Tires

Size	Used Tires	Used Tubes
30x3	\$ 3.50	\$1.35
30x3 1/2	4.25	1.45
31x3 1/2	4.50	1.50
32x3 1/2	5.25	1.50
34x3 1/2	5.50	1.60
31x4	6.25	1.65
32x4	7.00	1.60
33x4	7.25	1.70
34x4	7.75	1.70
35x4	7.50	1.75
36x4	7.50	1.75
34x4 1/2	8.00	1.75
35x4 1/2	8.00	1.80
36x4 1/2	8.25	1.85
37x4 1/2	9.50	1.90
35x5	8.50	2.00
36x5	9.50	2.00
37x5	9.75	2.20

All goods shipped C. O. D. subject to examination, on receipt of 10% of order.

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These tires are of double thickness and have 12 plies of fabric; therefore no punctures, no blowouts. They are rebuilt by our special process, vulcanized and double treaded.

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30x3 1/2	5.50	33x4	7.50	36x4	9.00

Send \$1 deposit for each tire ordered, and we will send the tire, balance C. O. D.

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**\$7.50**

These Tires were originally guaranteed for 7500 miles—all firsts—15% deposit on all C.O.D. orders  
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36 x 4 1/2	\$10.00		

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Everything electrical for all cars

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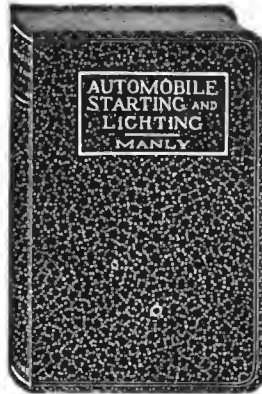
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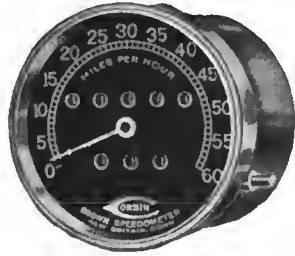
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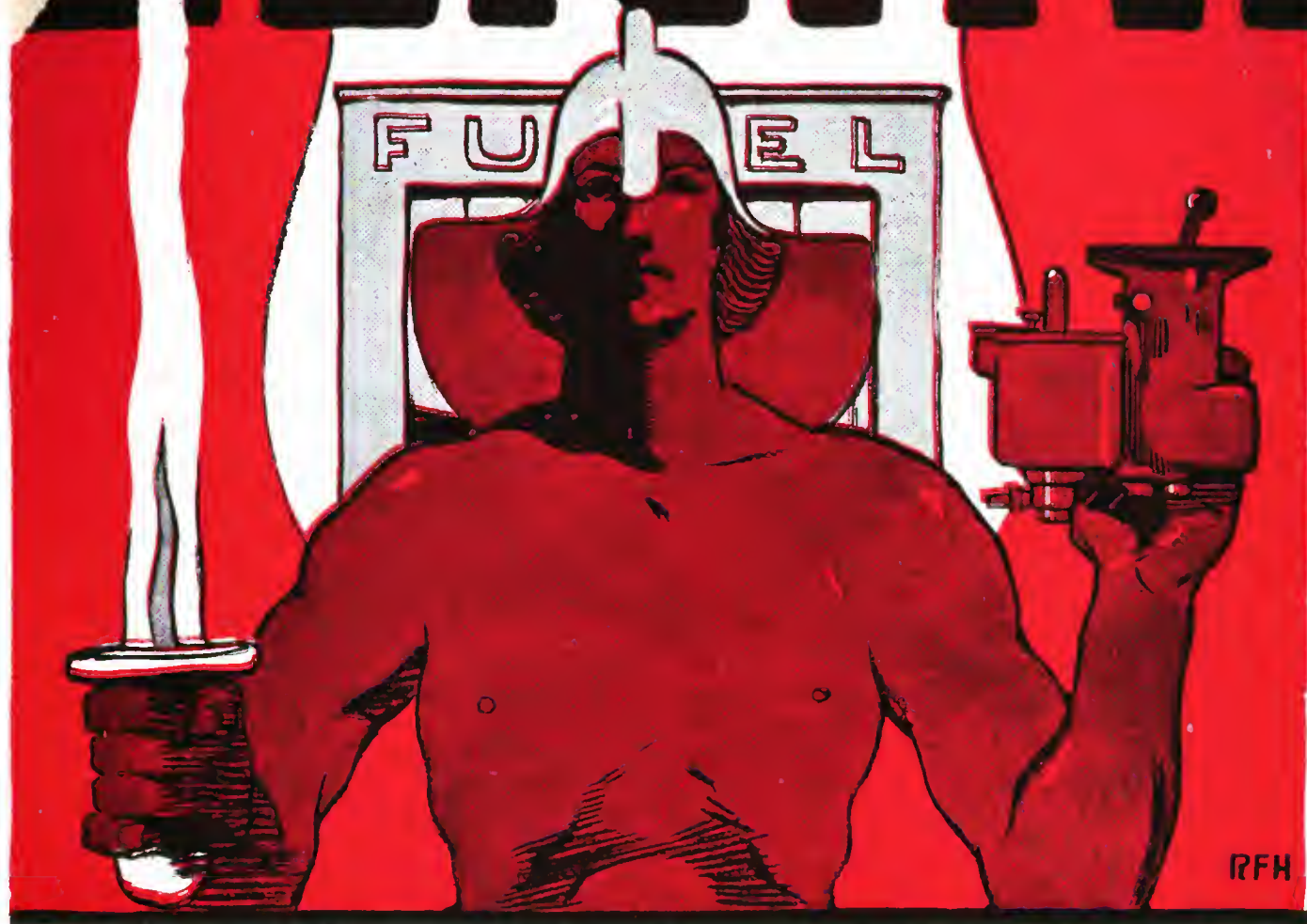
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B

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Maud L'Anphere Crook  
Stanford University, Cal.

Vol. XXXVI  
No. 5

NEW YORK, FEBRUARY 1, 1917

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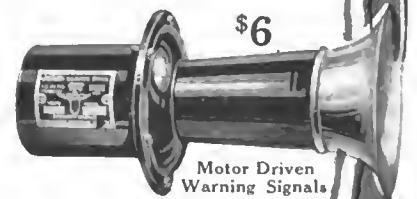
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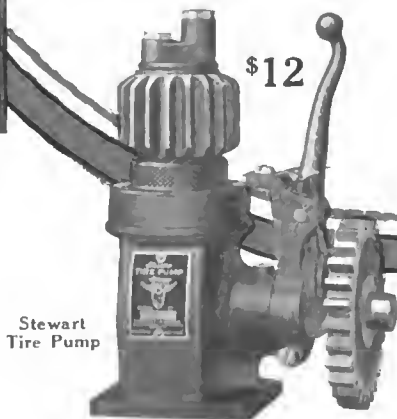
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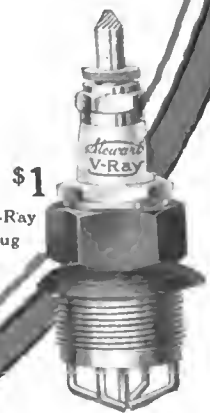
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\$12



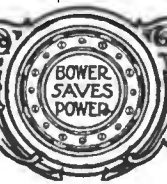
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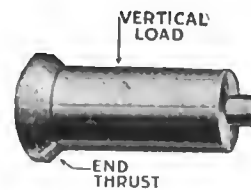
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**The AUTOMOBILE**  
 THE CLASS JOURNAL COMPANY  
 231-241 W. 39th STREET NEW YORK CITY  
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**BALL BEARINGS**

(Patented)



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 Are "NORMA" Equipped**



**THE NORMA COMPANY OF AMERICA**  
 1790 BROADWAY NEW YORK  
*Ball, Roller, Thrust and Combination Bearings.*

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*Studebaker*  
Established 1852

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# Studebaker VALUE proves its superiority at the Automobile Shows

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A comparison of Studebaker specifications, point by point, with the specifications of all other cars, proves that it costs many hundreds of dollars more to obtain the same essentials of good motor car construction.

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**The car that the Studebaker Dealer sells  
combines more of the most popular and  
saleable features than any other car—at a  
price that makes it the great value of 1917**

**It pays to be a *Studebaker* dealer**

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# The AUTOMOBILE

VOL. XXXVI

NEW YORK—THURSDAY, FEBRUARY 1, 1917—CHICAGO

No. 5

## 1916 Exports Total \$120,596,921

\$9,416,782 More Than 1915—  
Trucks Decrease—Passenger  
Cars Increase

	1915		1916	
	No.	Value	No.	Value
Cars . . . . .	41,869	\$35,045,492	61,947	\$43,725,087
Trucks . . . . .	22,082	\$9,834,246	18,903	\$52,870,774
Parts . . . . .	.....	16,300,401	....	24,001,060
Total . . . . .	.....	\$111,180,139	....	\$120,596,921

WASHINGTON, D. C., Jan. 31—The United States in the year 1916 set up a new record for automobile exports, its shipments of automobiles, trucks, and parts, amounting to \$120,596,921 as compared with \$111,180,139 in 1915 and \$34,171,568 in 1914. Automobile exports increased nearly 50 per cent, while truck exports decreased about 9 per cent. Parts increased 50 per cent. Automobile exports amounted to 61,947, valued at \$43,725,087 as compared with 41,869; valued at \$35,045,492 in 1915. Truck exports numbered 18,903, valued at \$52,870,774, as against 41,869 in 1915, valued at \$59,834,246. Parts totaled \$24,001,060 against \$16,300,401 in 1915.

### Cars Gain—Trucks Lose

Truck exports in December, 1916, fell below the mark established in the corresponding month in 1915. December, 1916, exports of trucks numbered 1331, valued at \$3,688,314, as against 1664 in 1915, valued at \$3,920,533. On the other hand, passenger car exports showed a notable increase, amounting to 4911, valued at \$3,658,650 as compared with 3664 in December, 1915, valued at \$2,710,758. Parts were lower in December, 1916, amounting to \$1,755,335, as against \$1,791,805 in the corresponding month in 1915.

### Drop in November

Comparing December, 1916, with the previous month, November, shows a big drop in all departments. There were

over 1000 less cars shipped in December last than in November and about 300 less trucks. Parts were about \$300,000 lower. The recent action of Great Britain in cutting down imports of automobiles and the high import duty levied on automobiles by a few of the other countries has had a potent effect on shipments from the United States.

### Kissel Adds a Twelve

CHICAGO, Jan. 29—Considerable interest has been aroused among the trade here by the appearance of a twelve-cylinder Kissel. The car incorporates a Weidely twelve-cylinder motor with the regulation overhead-valve action. It has been shown privately at the local branch of the company and will be run through a number of severe tests before being marketed. The chassis is a larger one than that of the Hundred-Point six model, but conforms in a great many respects to the same design.

### McClaren Racine Rubber President

RACINE, WIS., Jan. 29—H. L. McClaren, former president of the Mitchell-Lewis Motor Co., Racine, Wis., has been elected president of the Racine Rubber Co. to succeed Stuart Webster, who resigned because of ill health. Mr. McClaren formerly was head of the rubber company, which at that time was owned by the same interests as the Mitchell company. Recently the tire plant was purchased by the Ajax Rubber Co., Trenton, N. J. Mr. Webster will continue as a director and as treasurer of the company.

### Russia Bars Cars and Trucks

PETROGRAD, Jan. 25—The prohibition of the importation of vehicles other than those for railed tracks will become effective in Russia Feb. 1. Under this prohibition come carriages, omnibuses, light passenger vehicles, trucks and cars. Vehicles completely upholstered are also included.

## Chicago Business Is Unparalleled

Show Attendance 20% Greater  
Than in 1916—Dealers' At-  
tendance Breaks Record

CHICAGO, Jan. 30—Chicago's most successful show is half over and the volume of business done far exceeds any of the previous exhibitions. The paid attendance has been running 20 per cent ahead of last year. It is the greatest dealers' show that has ever been held in this country, according to the opinions of the leading manufacturers who are in attendance. As usual the show is nationwide in its scope. Dealers are here from the far corners of Maine and from southern California; they are here in greater numbers than ever before and are doing business on a scale hitherto unapproached. Invitations were issued to about 38,000 dealers all over the country. Each dealer was sent three tickets and this year they are not being registered, as it is impossible to get a numerical line on the dealers' attendance. Manufacturers are unanimous in their belief, however, that it has never been approached in previous years.

### Distributors Know Requirements

In many respects the business of the show stands unique in the history of the industry. Instead of the usual bargaining on allotments, the distributors are ready with their list of requirements and these estimates not only include the cars sold by the greater dealers themselves, but also for the entire organization of subdealers. There is a great amount of evidence that the territory represented by the Chicago show is being more intensively cultivated than ever before. This is clearly shown by the great increase in the number of subdealers. In some quarters there has been a reluctance noted among the small-

(Continued on page 272)

## Two Makers Raise Car Prices

**Liberty \$100 More, Glide \$125; Braender Tires Advance 10 to 20 Per Cent**

DETROIT, Jan. 26—The Liberty Motor Car Co., this city, will advance its prices on all models \$100 on Feb. 1. The touring car on that date will advance to \$1,195; the closed coupled four-passenger roadster to \$1,195; the brougham to \$2,450; and the touring Sedan to \$1,395.

The company will add a Springfield body model around the middle of March. This car will sell for \$1,795.

### Glide Raises Price \$125

PEORIA, ILL., Jan. 29—The Bartholomew Co., this city, manufacturer of the Glide Car, has raised its price from \$1,125 to \$1,250.

### Braender Tire Prices Raised

RUTHERFORD, N. J., Jan. 25—The Braender Rubber & Tire Co., this city, has advanced its prices 10 to 20 per cent on its tires and tubes. These new prices are effective in all States except the Rocky Mountain States where they are 5 per cent more. The 28 by 3 plain tread, formerly \$9.80, is \$11.25; non-skid, formerly \$11.25, is \$12.95; the \$2.90 tube is now \$3.60. The 32 by 3 plain tread has risen from \$15.35 to \$17.40; the non-skid from \$17.65 to \$20; and the red tube from \$3.60 to \$4.60. The 36 by 4½ plain tread, is now selling at \$35.40 and formerly sold at \$31.45; the non-skid type sells at \$40.70 as compared with \$36.15; and the red tube is \$8.30 as against \$6.70.

### Emerson General Sales Manager for Olds

LANSING, MICH., Jan. 29—P. L. Emerson has been appointed as general sales manager for the Olds Motor Works at this city. G. L. East has been made assistant sales manager. The position now occupied by Mr. Emerson has been vacant since last July, when Jay Hall resigned.

### Wilson Heads Belmont Sales

TOLEDO, Jan. 29—A. J. Wilson has been made advertising and sales manager of the Belmont Motor Car Co., which was recently formed here to manufacture motor cars.

**Hydraulic Buys Cleveland Welding**  
CLEVELAND, Jan. 30—The Hydraulic Pressed Steel Co. has decided to exercise its options for purchase of control of the Cleveland Welding & Mfg. Co., of

which E. T. Heinsohn is president. The money will be paid over this week. The purchase will increase the facilities of the company in the manufacture of automobile parts. Nothing was given out at this time regarding a rumored deal by which the control of a large interest in the company was to pass to Eastern capitalists.

### Chalmers Elects Officers and Directors

NEW YORK, Jan. 29—The Chalmers Motor Co. held a meeting in this city last week and elected Hugh Chalmers, president; E. C. Morse, vice-president; W. P. Kiser, secretary, and D. P. Turnbull, treasurer. The following comprise the new board of directors: Hugh Chalmers, E. C. Morse, W. P. Kiser, C. A. Woodruff, C. A. Pfeffer, C. C. Hinkley, all of Detroit, and B. Lockwood of New York.

Extensive manufacturing and selling plans were outlined. The company plans to build and sell 30,000 cars this year.

### Winton Co. Re-elects Officers

CLEVELAND, Jan. 25—The Winton Co. has re-elected the following officers to serve their twenty-first annual term: President, Alexander Winton; vice-president, Thomas Henderson; secretary and treasurer, George H. Brown. The company has never had any other officers since the business was started.

### White of U. S. L. Becomes Sales Mgr.

NIAGARA FALLS, N. Y., Jan. 30—John A. White, who has been connected with the U. S. Light & Heat Corp. for the past 8 years, has been promoted from manager of the Chicago office to sales manager, and will assume his new duties at once. He will be located at the home office in this city. His successor as manager of the Chicago office has not been announced.

### Reo Predicts Price Increase

DETROIT, Jan. 31—Reo will probably raise its prices within a few weeks, according to a statement issued by R. H. Scott, vice-president and general manager of the company. He states that 2-year-old material contracts are expiring without possibility of renewal, and materials are advancing from 25 to 100 per cent in cost.

### Durham with Stevens Motor

DETROIT, Jan. 29—B. F. Durham, who has been connected with the Maxwell Motor Co., and who is well known as "Bull Durham," has resigned his position to join the Stevens motor branch of the Moline Plow Co. as assistant sales manager.

## Brown-Lipe Gear Co. Elects Officers

**Chapin Retires as General Manager, But Retains Interest —Parsons New Manager**

SYRACUSE, N. Y., Jan. 27—At the annual meeting of the Brown-Lipe Gear Co., Syracuse, Jan. 25, the following officers and directors were elected: Alex. T. Brown, president; W. C. Lipe, first vice-president; G. W. Sponable, second vice-president; A. E. Parsons, secretary and general manager; and E. H. Hungerford, treasurer.

The above with H. W. Chapin compose the board of directors.

Owing to the great increase in the business of the Brown-Lipe Gear Co. and the Brown-Lipe-Chapin Co., Mr. Chapin has retired from the general management of the former concern so as to devote his entire attention to the general management of the Brown-Lipe-Chapin Co.

Mr. Chapin retains his financial interest in the Brown-Lipe Gear Co. and a place on the board of directors. A. E. Parsons, the new general manager of the Brown-Lipe Gear Co., has been patent attorney for both companies since their organization. He will devote all his time to the management of the Brown-Lipe Gear Co., but will retain his interest in the firm of Parsons & Bodell, patent attorneys, Syracuse, of which he is senior partner.

The Brown-Lipe Gear Co. has under way extensive work of expansion of the plant and its facilities.

### Durant and Chrysler to California

DETROIT, Jan. 27—Following the Chicago automobile show, W. C. Durant and W. Chrysler, presidents of the General Motors Co. and the Buick Motor Co. respectively, will leave for an extended trip to California.

### Harry Ford Export Co. Director

DETROIT, Jan. 27—Harry Ford, president of the Saxon Motor Car Corp., has been made a director of a \$5,000,000 corporation formed recently in New York and Chicago, for the extension of commerce in foreign countries. The company will conduct and operate steamship lines and railroads, buy and sell securities, and will take over the operations of a company that has been in business for the past 16 years.

### Mills Joins Highway Tractor Co.

DETROIT, Jan. 27—S. W. Mills has joined the forces of the Highway Tractor Co., Indianapolis. Mr. Mills was formerly an engineer for the Fiat company.

## Army Truck Standards Discussed

### Chief Points Talked on Are Wheel Track, Radiators and Crankshafts

NEW YORK, Jan. 26—A further conference of the Truck Standards Division of the Society of Automotive Engineers was held in the rooms of the society here to-day, attended by W. M. Britton of the Quartermaster's Department at Washington, J. P. Utz, chairman-elect of the Standard Committee of the S. A. E. and Coker F. Clarkson, secretary, and the following members of the division, each chief engineer or truck engineer of his concern:

H. D. Church, Packard Motor Car Co., chairman.  
A. L. Riker, Locomobile Co.  
G. W. Smith, Nash Motors Co.  
B. B. Bachman, Autocar Co.  
L. P. Kalb, Kelly-Springfield Motor Truck Co.  
W. R. Strickland, Peerless Motor Car Co.  
W. T. Norton, Selden Motor Vehicle Co.

At this meeting the chief points discussed were wheel track, radiators and crankshafts. It was pointed out by Mr. Britton that the army was very desirous of having a uniform gage for all its vehicles; but more particularly for the 1½- and 3-ton trucks, for these must trail each other where the road has to be broken through virgin ground. Where the tracks are of different gage it is difficult for the following vehicle, if of a different measure, to negotiate the ruts. He stated that the army transport wagon tread of 61½ in. would best suit the army and also pointed out the desirability of having uniform tracks, front and rear.

#### Dunning Resigns from Chevrolet

FLINT, Jan. 29—Hugh Dunning has resigned as production manager of the Chevrolet Motor Co. and will soon become the production manager of the Stevens motor branch of the Moline Plow Co.

#### Innes Resigns from Dodge

DETROIT, Jan. 27—H. L. Innes has resigned from Dodge Brothers to take the position of factory manager of the Chevrolet Motor Co. at Flint.

#### Parker Again Heads Rust Proof

DETROIT, Jan. 27—Clark W. Parker was re-elected president of the Parker Rust Proof Co. of America and Wyman C. Parker was re-elected secretary-treasurer and general manager at the annual meeting of stockholders of the company this week.

The report of the president showed that the company had made a profit on

the direct business which had passed through the factory. Large contracts recently closed were not included in the assets.

J. G. Johnson was elected vice-president, E. C. Hoelzle assistant treasurer, W. M. Cornelius assistant secretary and L. Hulbert comptroller. Directors elected include H. A. Haigh, capitalist; L. G. Younglove, attorney; W. C. Parker, C. W. Parker, F. A. Richmond, merchant; G. D. Mason, architect, and J. G. Johnson, general manager of the American Car & Foundry Co.

J. D. Lucie, B. C. Layman and O. S. Johnson have joined the sales department of the company. They were formerly connected with the U. S. Tire Co.

#### Name Hayes Directors

DETROIT, Jan. 27—J. F. O'Hara and Carlton Higbie, investment bankers, were added to the board of directors of the Hayes Mfg. Co. at the annual meeting held this week. Another director will be added in the near future. All old directors were re-elected.

#### Williams with Klaxon Detroit Office

NEWARK, N. J., Jan. 29—H. R. Williams has been appointed sales engineer and manager of the Detroit office of the Klaxon Co., in charge of the factory equipment business. He was formerly with the Chanslor and Lyon Co., Seattle.

#### Enos Joins Steel Products Co.

DETROIT, Jan. 27—L. W. Enos, formerly connected with the Willard Storage Battery Co., has been appointed assistant sales manager of the Steel Products Co., Cleveland, and will handle the Michigan territory for the company.

#### Join Stephens Motor

FLINT, Jan. 27—Hugh C. Dunning, factory manager, and Fred Corbeille, assistant superintendent of the Chevrolet Motor Co., have resigned to accept positions with the Stephens Motor branch of the Moline Plow Co. at Freeport, Ill.

#### Strickland Leaves Bantam

DETROIT, Jan. 25—S. A. Strickland has resigned as mechanical and sales engineer of the Bantam Anti-Friction Co., effective Feb. 1.

#### Kerosene Carbureters for Ford

FRANKFORT, IND., Jan. 25—The Kerosene Carbureter Co., this city, has received an order from the Ford Motor Co., for 3000 carbureters. The Indiana Brass Co., this city, has been doing the machining and finishing but its other business has grown so that the Kerosene company contemplates building a factory.

## Front-Away Truck for \$675

### Millington Drive Is Through Front Axle—\$500,000 Company

CHICAGO, Jan. 24—The Millington Motor Car Co., this city, has entered the truck field with the Front-Away light delivery truck, a radical departure from previous designs in that it drives through the front axle and carries its frame unusually low.

The Millington company is a \$500,000 Delaware corporation, of whose stock half is 7 per cent non-voting cumulative preferred of \$100 par value. It absorbs the Millington Auto Engineering Co., which produced the Millington attachment to converting standard rear-driven trucks to four-wheel-drivers.

The Front-Away will be made in both a delivery and a runabout form, the delivery model to have a 1000-lb. capacity and to sell for \$675. Save for its unusually low frame—about even with the hubs, the vehicle resembles standard designs. The engine is under the hood, which is of stream-line design and merges with a cowl dash. The radiator is a V-type similar to that on Pathfinder cars. This extends sufficiently in front of the axle to conceal the middle of the axle. The front axle is a live one, with two bevel driving gears transmitting the drive by universals inclosed within globular steering knuckles.

The chassis has wire wheels and the rear axle is of the dropped type to clear the low frame. Semi-elliptics are used all around, the front ones being shackled at the front and pinned at the rear, thus taking propulsion by a pull instead of a push and making for steadier steering. The rear springs are suspended in the usual manner. Pneumatic tires are fitted.

#### Ewald Succeeds Campbell

NEW YORK, Jan. 27—H. T. Ewald has been elected president of the Campbell-Ewald Co., advertising agency. He succeeds F. J. Campbell who resigned as president, having disposed of his interests. C. A. Sloan was elected vice-president and G. C. Brown, secretary-treasurer. Mr. Campbell will remain with the organization for a time in an advisory capacity.

Mr. Sloan will be in charge of the local office. Among the new accounts that this company has recently taken over are the Advance-Rumely Co., La Porte, Ind., Dayton Engineering Laboratories Co., Dayton, Ohio; Van Blerck Motor Co., Monroe; Bearings Service Co., Detroit; United Motors Service, Chicago, and Perlman Rim Corp., New York.

## Detroit Cos. Plan Merger

### Valve and Brass Works Companies To Take Action on Plan Feb. 10

DETROIT, Jan. 29—The Detroit Valve & Fittings Co. and the Detroit Brass Works will hold a joint meeting of stockholders on Feb. 10 to take action on recommendations by the directors of each that the two corporations be merged. Both companies are large manufacturers of parts for automobiles.

Preliminary to the working out of the proposed merger the directors recommend that the stockholders approve an increase in authorized capital stock of each corporation and the distribution of a stock dividend among the shareholders of each.

#### To Increase Stock

It is proposed to increase the authorized capital stock of the Detroit Valve & Fittings Co. from \$500,000 to \$1,500,000 and to distribute a 30 per cent dividend in stock to the stockholders, and to increase the authorized capital of the Detroit Brass Works from \$400,000 to \$500,000, giving shareholders a 10 per cent stock dividend, this dividend in the latter company being made to simplify the merger.

#### Makers Organize Workmen's Bank

DETROIT, Jan. 31—The Morris Plan Bank, with \$500,000 capital, has been organized to loan money to working men. The organizers include Hugh Chalmers, W. C. Briggs, Roy Chapin, Edward Denby, Harry Ford, F. B. Leland, R. P. Joy, H. M. Leland, E. W. Loomis, L. G. Ollier and Alvan Macauley, all automobile and parts makers.

#### National Acme Holds Annual Meeting

CLEVELAND, Jan. 27—As was foretold in a recent issue of THE AUTOMOBILE, the stockholders of the National Acme Co. declared a quarterly dividend of 1½ per cent, payable March 1, at their annual meeting held Jan. 24, besides electing a considerable number of new directors to the board, and planning several additional buildings.

Seven new directors including C. S. Eaton, A. H. Wiggins, president of the Chase National Bank of New York, G. L. Stone of Hayden, Stone & Co., of Boston, H. L. Dillon, W. F. McGuire, Detroit, A. W. Hopkins and W. R. Mitchell, members of the active staff of the company, were added.

Officers elected were W. B. D. Alexander, president, E. C. Henn, vice-presi-

dent and general manager, A. W. Henn, secretary and treasurer.

It is understood that earnings are at the rate of 27 to 30 per cent on the stock. For the past 18 months the company has only been able to fill orders for old customers. The capacity of the company will be increased 100 per cent by the erection of a 6-acre plant ordered by the stockholders.

The stock will soon be listed on the New York and Cleveland stock exchanges.

#### Rood Resigns from F. S. Carr & Co.

BOSTON, Jan. 26—W. R. Rood, vice-president of F. S. Carr & Co., 31 Beach Street, Boston, resigned his position and his new connection is not yet announced. Mr. Rood is well known throughout the industry, and has been the active sales manager of the above organization for the past 8 years.

#### To Improve Detroit Financial Facilities

DETROIT, Jan. 31—The Michigan branch of W. P. Bonbright & Co., Inc., investment bankers, has been taken over by the following for the purpose of increasing the financial facilities for manufacturers in this city: W. C. Briggs, of the Briggs Mfg. Co.; Roy Chapin and Howard Coffin, of Hudson; L. J. Hoover, of the Hoover Steel Ball Co.; E. W. Lewis, of the Timken Detroit Axle Co.; Percy Owen, of the Liberty Motor Car Co.; B. F. Tobin, of the Continental Motors Corp., and others.

Mr. Bonbright will retain a substantial interest in the new company in Detroit. At present he has no provision for the financing of large manufacturers who are forced to make their loans in other cities. This new institution will handle such business.

#### Edge Agricultural Machinery Director

LONDON, Jan. 13—S. F. Edge has been appointed by the Ministry of Munitions in charge of the manufacture and importation of agricultural machinery. He was one of the men earliest in the racing and business ends of the automobile industry here. He was associated for a number of years with the Napier company. Upon retiring from this line of business he became an expert in agriculture.

#### Hyatt Creates Farm Machinery Dept.

CHICAGO, Jan. 29—F. N. G. Kranich has joined the engineering staff of the Hyatt Roller Bearing Co., this city, and will devote his entire attention to the implement and farm machinery end of the company's work. Under his direction there will be a special department devoted exclusively to the application of Hyatt bearings for all agricultural machinery other than tractors.

## Plan To Classify Gasoline

### Proposal To Govern Sale of Fuel by Dividing Into Three Grades

DETROIT, Jan. 30—Facts now being gathered in Washington are to be used in an ordinance governing the sale of gasoline in this city, if the plans of J. C. McCabe, superintendent of the municipal department of safety engineering, carry. Mr. McCabe has just returned from Washington, where he was in conference with government experts regarding the gasoline problem.

The proposed plan calls for a division of three classifications of gasoline so that motorists will know what grade they are securing. The first two, class A and class B, will be known as automobile fuel. Class C will be for use in stationary engines only.

Experts here claim that during the winter months the gasoline is frequently more kerosene than gasoline, and expect to attach a penalty to the classification ordinance amounting to \$100 to insure owners against securing inferior grades. McCabe's idea is to specify the "end points" of the distillation temperatures (see page 301).

#### Percy Martin English Engine Controller

LONDON, Jan. 13—Percy Martin has been appointed engine controller by the Ministry of Munitions. He has been given control of the supply of all internal combustion engines required by the fighting services and in agricultural machinery. Mr. Martin was born in the U. S. A., has served in the Austrian Government arms factory, has been for 12 years managing director of the Daimler company, and was appointed recently to the Air Board, which controls the production of government aeroplanes. The board, consisting of three men, has no authority, however, over the use of aeroplanes once they are furnished to the British army or navy.

#### 42-Acre Plant for Redden

NEW YORK, Jan. 31—The Redden Motor Truck Co., Detroit, as reported in THE AUTOMOBILE for Jan. 11, has received the backing of a large financial group in the West, who have placed at its disposal 42 acres of factory space at Jackson, Mich. The company plans to turn over its truck attachment sales of the country to approximately 2000 truck merchants located in the natural selling territories.

It is reported that officials of the Briscoe Motor Corp. have purchased the company.

## Two New Day-Elder Trucks

1½ and 2½ Tonners Added—  
Junior Type Increased from  
1250 to 1500 Lb. Capacity

NEW YORK, Jan. 27—Two new models have been added to the line of the Day-Elder Motors Co., Newark, N. J., prices have been readjusted and the capacity of the Junior model has been increased from 1250 lb. to ¾-ton. The new models are a 1½-ton and 2½-ton. The line and prices now are: ¾-ton, \$975; 1-ton, \$1,250; 1½-ton, \$1,500, and 2½-ton, \$1,985.

The two new models are similar to the older ones in general outline and have worm drive.

### Penny Concentrates on Car

PITTSBURGH, Jan. 27—Production of its commercial model has been discontinued by the Penny Motors Corp., this city. This concern was formerly the Kosmath Co., Detroit, manufacturing a vehicle from the designs of E. T. Birdsall. When it reorganized and moved to Pittsburgh it added a passenger model. From now on this will be the exclusive product of the concern.

### 15,000 Maxwell 1-Ton Trucks

NEW YORK, Jan. 27—Walter E. Flanders, president of the Maxwell Motor Co., Detroit, Mich., has stated that as a result of the reception of the new 1-ton Maxwell truck exhibited in the Hotel Biltmore during show week here, definite plans for a production of 15,000 of the vehicles have been formulated.

### Globe Trucks to Be Made in St. Louis

ST. LOUIS, Jan. 29—Globe trucks are to be made in St. Louis in the future. The Globe Motor Truck Co. of this city has taken over the assets of the business formerly conducted under a similar name at Northville, Mich. The Globe truck until recently was made by a department of the Globe Furniture Co., Northville, Mich. The principal model is a 6-cylinder 2¼-tonner.

### Pullman Staff Reorganized

YORK, PA., Jan. 30—As an essential feature in the reorganization of the Pullman Motor Car Co. and with a view to increasing the efficiency of its organization and rendering a better service to its dealers, its official staff has been entirely revamped.

The office of general manager, formerly occupied by H. W. Hayden, has been abolished and in its stead all departments will report to the operating board,

consisting of Messrs. Keyworth, Hoff and Schmidt. Sales, advertising and purchases will be under the jurisdiction of A. R. Cosgrove, assisted by R. E. Trout, E. W. Van Duzen and H. C. Curtis.

Finance and accounting will be under the supervision of H. P. Jones. Service, stock and field service will be under S. L. Fuller; cost accounting will be under the direction of G. Ed. Schwartz. Factory production will be under the supervision of Charles G. Schwartz. Office management will be in charge of Mr. Delabar.

### Franklin Doubles Car Output

SYRACUSE, Jan. 27—The H. H. Franklin Mfg. Co., this city, is now turning out thirty cars a day, or at the rate of 9000 a year. This is double the rate of production a year ago, the increased business having necessitated large addition to the plant. The company has no cars in storage.

### Macon Motor Car Co. Takes Over All-Steel Assets

MACON, MO., Jan. 25—The Macon Motor Car Co., this city, has been organized to take over the business and assets of the All-Steel Motor Car Co., which was recently dissolved by order of the court. The new company is capitalized at \$600,000, one-half of which is fully paid up. Judge N. M. Shelton has been appointed as trustee, to receive the stock of the old company and issue stock in the new one in lieu thereof. The old stockholders will not only receive the full amount of stock owned by them, but new stock in Macon company, to the amount of \$85,000, will be distributed among them pro-rata, in addition thereto. The personnel of the board has not been determined.

### Imperial Wheel Has Prosperous Year

FLINT, Jan. 27—The Imperial Wheel Co. which manufactures wheels for the Buick Motor Car Co., Chevrolet Motor Car Co., Dort Motor Co., and the Oakland Motor Car Co., has increased its business in the 4 years of its existence until it is now selling 400 per cent more wheels than during the first year.

### Pallau Steel Spring Elects Officers

DETROIT, Jan. 27—The stockholders of the Pallau Steel Spring Co. of Mt. Clemens, Mich., held their annual meeting this week and elected J. N. O'Brecht, president, A. T. Donaldson, vice-president, P. J. Ullrich, secretary and A. Marlette, treasurer. Directors chosen include A. T. Donaldson, J. N. and L. O'Brecht, R. A. Waterbury, P. J. Ullrich, W. Kruse and F. E. Nellis of Mt. Clemens, and Andrew Healey and A. Featherstone of Detroit.

## To Improve Industrial Efficiency

Standardization of Welfare  
Work and Education, Patriotic  
Congress Plan

WASHINGTON, D. C., Jan. 27—Improvement of our industrial efficiency through Americanization of the workers might be characterized as the keynote struck at the 3-day Congress of Constructive Patriotism brought to a close here to-day. While the scope of the subjects considered was very broad there were three addresses made which contained matters of interest to manufacturers in the automobile field. These were: Americanization by Industry, by Miss Frances A. Kellor, National Americanization Committee, New York; Industrial, by Howard E. Coffin, chairman of Committee on Industrial Preparedness, Naval Consulting Board; and Americanizing Detroit, by Walter C. Piper, former president National Association Real Estate Boards, Detroit, Mich.

Miss Kellor, after pointing out that seasonal employment means continual shifting about for the workers and overtime work and night and day shifts nullify evening school possibilities, proposed a comprehensive movement to Americanize the workers by standardizing welfare work, educating the workers and improving plant management.

Mr. Coffin, after reviewing the work of the Naval Consulting Board, pointed out our lack of industrial preparedness for turning factories quickly into munitions works. He stated that a text book on munitions work is being prepared. The work accomplished by the Committee on Industrial Preparedness of the Board has now been turned over to the newly created Council of National Defense.

Mr. Piper touched on the welfare work of the Americanization Committee of the Detroit Board of Commerce in cooperation with Detroit manufacturers to further education of workers by night schools and to classify foreign workers to facilitate naturalization. The policy of "Americans First" adopted by the Packard company and other automobile makers is found very effective.

### Discher Gets Bumper Injunction

MILWAUKEE, WIS., Jan. 27—A preliminary injunction has been granted G. F. Discher, president and general manager of the Gemco Mfg. Co., this city, against the Shadbolt & Boyd Iron Co., prohibiting the sale of an automobile bumper manufactured by the Emil Grossman Mfg. Co., pending trial of a suit for in-

fringement. The injunction covers patent No. 1,052,224, relating to a bumper bracket having a lug, which bears against the front end of the automobile frame side member, and an adjustable clamp, using a transverse bolt passing through two vertical slots, one on each side of the frame member.

The injunction covers the eastern district of Wisconsin. The Grossman company will appeal the decision.

**Racine Rubber's 1916 Net Profit \$720,189**

NEW YORK, Jan. 29—The Racine Rubber Co. in its report to the local Stock Exchange showed a net profit in 1916 of \$720,189, compared with \$540,497 in 1915 and \$573,352 in 1914. Its surplus amounted to \$894,193. Its gross income in 1916 amounted to \$4,788,171 and its merchandise cost to \$3,568,886, leaving an operating profit of \$1,219,285.

**Gasoline in Savannah Advanced 2 Cents**

SAVANNAH, GA., Jan. 30—Gasoline prices in this city have been advanced 2 cents a gallon to 22 cents. Further advances are expected.

**Louisiana and South Carolina Gasoline 1 Cent Higher**

CHARLSTON, S. C., Jan. 30—South Carolina gasoline prices have been advanced 1 cent a gallon to a maximum of 26½ and minimum of 24½, and 1 cent a gallon in Louisiana to 23 maximum and 22 minimum.

**N. Y. Gasoline Prices Up 1 Cent**

NEW YORK, Jan. 30—Gasoline prices in this city have risen 1 cent to 23 to garages and 25 cents a gal. to consumers. This puts the price back to that prevailing between Aug. 7 and Sept. 5, 1916.

**Gasoline 1 Cent Higher in Houston**

HOUSTON, TEXAS, Jan. 25—Gasoline has gone up in price 1 cent a gallon to a maximum of 23 cents and a minimum of 22 cents, tank wagon basis.

**\$7,518,434 Is Ajax Income**

**1916 Net Profits \$548,123—  
Profit and Loss Surplus  
\$139,247**

NEW YORK, Jan. 29—The Ajax Rubber Co., in its report to the New York Stock Exchange, shows a gross income from Aug. 31 to Dec. 31, 1916, of \$7,518,434, and net profit from trading of \$548,123. Profit and loss surplus amounted to \$139,247.

The complete report follows:

Gross Income .....	\$7,518,434
Miscellaneous debits .....	5,909,702
Gross profit .....	\$1,608,732
Operating expenses, depreciation, etc. ....	1,060,609
Net profit from trading .....	\$548,123
Dividends paid .....	408,876
Profit and loss surplus .....	\$139,247

Balance sheet of the Ajax Rubber Co., Inc., as of Dec. 31, 1916, reported to the New York Stock Exchange, follows:

Assets	
Real estate, machinery, etc. ....	\$672,156
Cash on hand and in banks. ....	255,901
Notes receivable .....	50,468
Personal accounts .....	1,725
Accounts receivable .....	944,461
Inventories .....	1,715,592
Deferred assets .....	102,409
Good will .....	930,965
	\$4,673,677
Liabilities	
Capital stock .....	\$4,000,000
Accounts payable .....	393,055
Reserves for depreciation, etc. ....	141,375
Profit and loss surplus .....	139,247
	\$4,673,677

**Lee Rubber Passes Dividend**

CONSHOHOCKEN, PA., Jan. 26—The directors of the Lee Rubber & Tire Corp., this city, passed the dividend on the stock. Heretofore 50 cents a share regular and 25 cents a share extra were disbursed quarterly. Labor troubles which decreased production and a general increase in the cost of crude materials are the reasons for the passing of the dividend.

The directors have considered it wise to conserve the surplus for the develop-

ment of its business. The company has expended a considerable sum of money in completing a new mill for the manufacture of miscellaneous goods, in which operations have recently been started, and in putting in additional machinery and equipment which should be installed in the early part of the year and which will nearly double its capacity.

**Templar Offers Stock to Public**

CLEVELAND, Jan. 29—The Templar Motors Corp. is offering its stock to the public. The price is \$10 per share, which is its par value. The company recently received the approval of the Ohio Securities Commission.

Officers of the company are: M. F. Bramley, president of the Cleveland Trinidad Paving Co., president; A. Dean, chief engineer the Ferro Machine & Foundry Co., vice-president, E. W. Davis, president of the Davis & Farley Co., treasurer; W. O. Cooper, manager of organization.

The engineering department is composed of A. M. Dean who was formerly the chief engineer of the Pope-Hartford Automobile Co.; P. F. Hackethal, recently assistant engineer of the Mercer Automobile Co.; Allen Bartlett, who was formerly the experimental engineer of the Stearns Automobile Co., and M. E. Morningstart, formerly of the Chalmers engineering department.

The company states that its engines are under construction and that factory plans are being given consideration.

**Copper and Aluminum Higher**

NEW YORK, Jan. 31—This week's materials' markets were featured by a rise in aluminum and copper prices and a drop in rubber. Aluminum has risen to 58 cents a pound, a gain of 2 cents; copper has gone up 1½ cents a pound to 32½ cents; rubber prices have declined 1 cent a pound on Para and 2 cents on Ceylon grades. Sulphuric acid has declined 50 cents a gallon to \$1.

**Goodrich Has \$5,500,000 Surplus**

NEW YORK, Jan. 25—Net profits of approximately \$9,550,000 were made by the B. F. Goodrich Co., in 1916, after making full provision for all maintenance charges, depreciation, bad and doubtful debts, and other items. The surplus in the year just closed was close to \$5,500,000.

This amount, added to the surplus carried over as at Dec. 31, 1915 of \$10,580,000 shows undivided profits of approximately \$14,900,000 after deducting the four quarterly dividends of 1% per cent on the preferred and 4 per cent on the common outstanding, together with the following provisions: \$700,000 for the redemption of preferred stock; \$121,460 representing the reduction of preferred

**Daily Market Reports for the Past Week**

Material	Tues.	Wed.	Thurs.	Fri.	Sat.	Mon.	Week's Changes
Aluminum, lb. ....	.56	.56	.56	.56	.56	.58	+ .02
Antimony, lb. ....	.16	.16½	...	.19½	.19½	.19½	+ .03½
Bessemer Steel, ton. ....	65.00	65.00	65.00	65.00	65.00	65.00	...
Copper, Elec., lb. ....	.31	.31	.31	.32	.32	.32½	+ .01½
Copper, Lake, lb. ....	.31	.31	.31	.32	.32	.32½	+ .01½
Cottonseed Oil, bbl. ....	13.20	12.40	12.50	12.40	12.40	12.40	— .80
Fish Oil, Menhaden, Brown. ....	.73	.73	.73	.74	.74	.74	+ .01
Gasoline, Auto, bbl. ....	.22	.22	.22	.22	.22	.23	+ .01
Lard Oil, prime, gal. ....	1.35	1.35	1.35	1.35	1.35	1.35	...
Lead, 100 lbs. ....	7.80	8.00	8.00	8.12½	8.13	8.25	+ .45
Linseed Oil, gal. ....	.95	.95	.95	.95	.95	.95	...
Open-Heartb Steel, ton. ....	65.00	65.00	65.00	65.00	65.00	65.00	...
Petroleum, bbl., Kans., crude. ....	3.05	3.05	3.05	3.05	3.05	3.05	...
Petroleum, bbl., Pa., crude. ....	1.70	1.70	1.70	1.70	1.70	1.70	...
Rapeseed Oil, refined, gal. ....	1.00	1.00	1.00	1.00	1.00	1.00	...
Rubber, Fine Up-River, Para, lb. ....	.76½	.76½	.76½	.76½	.76½	.75½	— .01
Rubber, Ceylon, First Latex, lb. ....	.77	.78	.76½	.76	.76	.75	— .02
Sulphuric Acid, 60 Baume, gal. ....	1.50	1.00	1.00	...	1.00	1.00	— .50
Tin, 100 lb. ....	45.50	45.38	45.38	45.38	45.38	45.63	+ .13
Tire Scrap, lb. ....	.06½	.06½	.06½	.06½	.06½	.06½	...

purchased from cost to par, and a further amount of \$100,000 appropriated for pension fund.

At the regular quarterly meeting of the directors on Jan. 24 a dividend of 3½ per cent was declared on the preferred, payable 1¼ per cent April 2 and 1¼ per cent July 2. A quarterly dividend of 1 per cent was declared on the common, payable May 15.

The directors voted, subject to the approval of the stockholders at their annual meeting March 14, to retire 9000 shares of preferred prior to July 1, 1917. This makes a total retirement of 36,000 shares covering charter provision for retirement of preferred up to July 1, 1917.

The net earnings for 1916 were less than those of 1915, which is largely due to the fact that advances in selling prices have not kept pace with rapidly increasing costs.

Official figures show a return to common stockholders of 12.73 per cent as compared with 17.17 per cent in 1915 and 5.6 per cent in 1914.

The company continues to pay for its plant extensions out of earnings. That is why the dividend on Goodrich common has been kept to 4 per cent.

**Ratify Prest-O-Lite Increase**

NEW YORK, Jan. 26—At a special meeting of the Prest-O-Lite Co., yesterday, the plan for increasing the capital stock of the company from 80,000 to 100,000 shares, making the amount of the stated capitalization \$1,000,000, was ratified.

**Securities Lack Demand**

**Low Price of General Motors Has Potent Effect on Rest of Issues**

NEW YORK, Jan. 31—A sudden determination on the part of a few floor traders yesterday to bring down the price of General Motors had a most potent effect on the rest of the motor issues. General Motors had been selling at 119½. For no reason other than the fact that General Motors pays only 4 per cent and was out of line with some stocks which pay more and sell for less was the stock made the object of the bearish attack. Though they succeeded in bringing down prices about 3 points, the stock was left alone by the public, which relied more on earnings than on the values of dividends. Studebaker dropped 2 points in the flurry and Maxwell 1 point.

Up to Monday automobile and accessory issues held fairly strong. A few of the issues were from a fraction to 7 points higher than the previous Monday. Losses were slight.

The Paige-Detroit company has listed on the curb 200,000 shares of common and 150,000 preferred, par value \$10.

**New S. R. B. Reorganization Plan**

PHILADELPHIA, Jan. 30—The Standard Roller Bearing Co. protective committee plans a new reorganization plan as a re-

sult of the decree of the United States District Court of New Jersey directing the sale of all the property of the company. An offer has been received for the purchase of the common and preferred stock at \$7 per share.

The consent of at least 80 per cent of the stock is required, and also that the sale of the company's assets and properties take place by Feb. 27.

The New York syndicate which makes the offer has deposited \$10,000 as a guarantee of good faith. The committee requests deposits of stock with the Bankers' Trust Co. of New York.

**Dividends Declared**

Republic Rubber Co., quarterly of 2 per cent on common, payable Feb. 1 to stock of record Jan. 25, and 1¼ per cent on preferred, payable March 1 to stock of record Feb. 20.

**Harroun's Michigan Stock Approved**

DETROIT, Jan. 30—The Harroun Motor Co. has been permitted by the Michigan Securities Commission to sell \$1,000,000 worth of treasury stock in this State, provided the original promoters, meaning Mr. Harroun and his associates, place \$4,000,000 of their stock in escrow with the commission. This stock is to be held until the company is able to pay 6 per cent on the entire \$10,000,000 capitalization. When the stock is escrowed the company may sell \$1,000,000 of the treasury stock in Michigan, paying a commis-

**Automobile Securities Quotations on the New York and Detroit Exchanges**

	Bid	Asked	Net Ch'ge		Bid	Asked	Net Ch'ge
Ajax Rubber Co.	74½	75	+2	Stewart-Warner Speed. Corp. com.	99¼	100¼	+¼
J. I. Case T. M. Co. pfd.	85	86	..	*Studebaker Corp. com.	104½	105½	-3½
Cbalmers Motor Co. com.	32	33	+7	*Studebaker Corp. pfd.	106½	108½	-2
Chalmers Motor Co. pfd.	..	..	..	Swinebart Tire & Rubber Co.	84	86	..
*Cbandler Motor Car Co.	99	100	..	United Motors Corp.	41¾	42½	-5¼
Chevrolet Motor Co.	110	115	-5	*U. S. Rubber Co. com.	59¾	60	-¾
Fisher Body Corp. com.	37	41	..	*U. S. Rubber Co. pfd.	109¼	110¼	-1
Fisher Body Corp. pfd.	93	96	-1	White Motor Co.	51	52	..
Fisk Rubber Co. com.	75	85	..	*Willys-Overland Co. com.	35¾	35¾	-¾
Fisk Rubber Co. 1st pfd.	110	115	..	*Willys-Overland Co. pfd.	97½	98½	..
Fisk Rubber Co. 2d pfd.	90	100	..				
Firestone Tire & Rubber Co. com.	144	146	+4				
Firestone Tire & Rubber Co. pfd.	108	109	+1				
*General Motors Co. com. (new)	114¾	114¾	..				
*General Motors Co. pfd. (new)	91½	91½	..				
*B. F. Goodrich Co. com.	59¼	59¼	-¾				
*B. F. Goodrich Co. pfd.	111	111½	+½				
Goodyear Tire & Rubber Co. com.	277	280	-1				
Goodyear Tire & Rubber Co. pfd.	107¾	108¼	..				
Grant Motor Car Corp.	7	9	..				
Hupp Motor Car Corp. com.	5	5½	+2				
Hupp Motor Car Corp. pfd.	..	..	..				
International Motor Co. com.	15	20	-3				
International Motor Co. 1st pfd.	65	75	-3				
International Motor Co. 2d pfd.	25	40	..				
*Kelly-Springfield Tire Co. com.	58½	60	-½				
*Kelly-Springfield Tire Co. 1st pfd.	90	95	-2½				
*Lee Rubber & Tire Corp.	23½	24	+½				
*Maxwell Motor Co. com.	54¾	55½	-3¾				
*Maxwell Motor Co. 1st pfd.	72	74	+¼				
*Maxwell Motor Co. 2d pfd.	38	39	-½				
Miller Rubber Co. com.	254	256	+6				
Miller Rubber Co. pfd.	105¾	106¾	-1¾				
Packard Motor Car Co. com.	..	160	..				
Packard Motor Car Co. pfd.	101½	102	+1				
Paige-Detroit Motor Car Co.	40¾	41	+½				
Peerless Truck & Motor Corp.	16	19	-1				
Portage Rubber Co. com.	166	169	+2				
Regal Motor Car Co. pfd.	27	35	..				
Reo Motor Car Co.	37½	38	-1½				
Saxon Motor Car Corp.	63	65	-1				
Springfield Body Corp. com.	77	83	..				
Springfield Body Corp. pfd.	110	120	..				
Standard Motor Construction Co.	5½	6½	..				

\*At close Jan. 29, 1917. Listed New York Stock Exchange. Quotations by John Burnham & Co.

**OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE**

	Bid	Asked	Net Ch'ge
Auto Body Co.	..	37	..
Chalmers Motor Co. com.	..	..	..
Chalmers Motor Co. pfd.	..	..	..
Continental Motor Co. com.	38	38½	..
Continental Motor Co. pfd. (new)	98½	..	-1
Ford Motor Co. of Canada.	..	264	..
General Motors Co. com.	..	..	..
General Motors Co. pfd.	..	..	..
Maxwell Motor Co. com.	54	56	-3
Maxwell Motor Co. 1st pfd.	..	..	..
Maxwell Motor Co. 2d pfd.	..	..	..
Packard Motor Car Co. com.	..	160	..
Packard Motor Car Co. pfd.	..	102	..
Paige-Detroit Motor Car Co.	40¾	41	..
W. K. Prudden Co.	49¾	50½	+½
Reo Motor Car Co.	37½	37¾	-1¾
Studebaker Corp. com.	106	108	-2
Studebaker Corp. pfd.	..	..	..
C. M. Hall Lamp Co.	29¾	30½	..

**INACTIVE STOCKS**

Atlas Drop Forge Co.	37	..	+1½
Kelsey Wheel Co.	50	54	..
Regal Motor Car Co. pfd.	27	35	..



sion not to exceed 10 per cent for brokerage.

All advertisements regarding such sale must be first submitted for the commission's approval. The attorneys for the Harroun company state that the provisions imposed by the commission are accepted.

#### Chicago Show Business Unparalleled

(Continued from page 265.)

er dealers, which has been attributed to some extent to the increase in prices. Particularly noticed in the dealers having the country territory. For this class of dealer a raise in price from \$1,000 to \$1,200 represents quite a difficulty to overcome.

On the whole allotments are running 50 per cent ahead of a year ago. The great increase in production scheduled by the larger concerns is a true interpretation of the condition of the country. With many it is not a case of how many cars they can sell but how many they can get. Naturally, with the freight-car situation as it is the Chicago territory is considerably affected. One of the results of this is that buyers with foresight are ordering their cars 2 months before they ordinarily would.

Cars are being sold at retail right off the floor. This is not counted upon as one of the results of the show, and where it is done it is simply an added amount taken in. One of the most expensive cars exhibited was sold off the floor at retail and paid for in cash.

The accessory dealers have found the same conditions. One prominent motor manufacturer who comes to the show more as a part of his advertising program than as a matter of direct business was surprised to find that deals could be made right on the floor. Other accessory men in other fields found the atmosphere charged with valuable inquiries. The percentage of the attendants at the show who actually come to do business is unbelievably great. The show is proving to be Chicago's greatest and the intensive selling and business interest manifested presages a prodigious business turnover for the coming year.

#### Pennsylvania Rubber Expands

NEW YORK, Jan. 22—The Pennsylvania Rubber Co. has completed additions to its factories at Jeannette, Pa., to increase the output of the plant to 2500 tires per day, a production increase of 500 per cent for the past 3 years.

#### Daniels Represents Bausch Gear Dept.

SPRINGFIELD, MASS., Jan. 29—The gear department of the Bausch Machine Tool Co., this city, will be represented by H. A. Daniels.

## Japanese Company To Make Cars

### Tokio Firm To Manufacture Four-Passenger—To Use Cheap Petroleum

TOKIO, Jan. 29—The European war has forced Japan manufacturers to enter the automobile business. The Nippon Sharyo Kaisha (Japanese Vehicle Co.) has undertaken the manufacture of cars in designs adapted to the peculiar needs of Japan. The company will make 10-hp. cars with accommodations for four passengers each, which is considered as sufficient in this country. These cars will be of the width of a jinrikisha and will consume cheap petroleum. Their selling price will be about \$500.

#### National Daylight-Saving Convention Opens 2-Day Session

NEW YORK, Jan. 31—The National Daylight-Saving Convention opened a 2-day session yesterday at the Hotel Astor. The convention is united on the principle but divided on its application. Some of the advantages which, the speakers said, the plan would result in were better health of workers generally, in that they would have more time for daylight recreation after working hours, great economy in lighting bills and diminished straining of the eyes of workers during the last hour before going home.

The only division of opinion among the delegates appears to be as to just when to set the clock forward and for how long. One faction would make the country rise early throughout the year. Most of the delegates at the convention seemed to favor the forward movement for only 5 or 5½ months per year.

#### Hancock Co. Giving Bonus to Workers

CHARLOTTE, MICH., Jan. 29—The Hancock Mfg. Co., which makes automobile accessories, will shortly distribute \$8,000 among forty-two employees in amounts varying from \$100 to \$400 as shares of the company's profits. The amount paid is based on the length of service.

#### To Incorporate Tire Protector Business

STEVENS POINT, WIS., Jan. 29—Incorporation of the steel tire protector business founded at Stevens Point, Wis., several years ago, by J. J. Bukolt, is now under way and within a short time articles will be filed in behalf of a company to be capitalized at \$200,000. There is now available for the purposes of this business a large factory building just vacated by the Automatic Cradle Mfg. Co., of which Mr. Bukolt also is president, to take occupancy of a new group

of industrial buildings. New equipment is being purchased and will be delivered in time to commence manufacturing operations on tire protectors on a large scale by May 1. During 1916, more than 2000 sets of protectors were manufactured, and booked orders call for nearly twice that number.

#### Charter Oak Leases Plant

NEW BRITAIN, CONN., Jan. 25—The Eastern Motors Syndicate, manufacturer of the Charter Oak car, has leased a plant in this city, containing about 15,000 sq. ft. of floorspace. The building is one-story and 118 by 110 ft. The initial appearance of the car will be at the Boston Show in March.

#### Fisk to Add Mill Building

CHICOPEE FALLS, MASS., Jan. 26—The plant of the Fisk Rubber Co., this city, will be doubled in the near future by the addition of a mill building. It is 60 by 105 ft. and six stories high. By reason of this expansion the production will be materially increased and employment will be given to more men. The floorspace devoted now to the manufacture of tires exclusively totals 29 acres.

#### MacInnes Resigns from Advertising Agency

RACINE, WIS., Jan. 29—W. J. MacInnes has resigned as manager of the Western Advertising Agency, this city, to join the service staff of the Mahin Advertising Co. Among Mr. MacInnes' former connections are the General Motors Co., Editor of *Business*, Detroit, advertising manager and assistant publisher, St. Joseph, Mo., *Evening Press* and automobile editor of the *Chicago American*.

#### \$60,000 Minneapolis Plant for Oldfield

MINNEAPOLIS, Jan. 27—Lee Oldfield, former automobile racer, will expand his engine making business here and has plans for a \$60,000 factory in the Minneapolis Industries Assn. new tract. He heads the Oldfield Motors Corp., which makes the Oldfield rotary aeroplane engine. Quarters at 2335 Central Avenue will be abandoned June 15 for the new plant, which will have 400 ft. of trackage.

#### Rainier Installed in New Flushing Plant

FLUSHING, N. Y., Jan. 29—The Rainier Motor Corp. has moved into its new plant at Flushing and is producing ten trucks daily. The executive and sales offices have been transferred here from the New York showrooms which are now used exclusively for retail sales business. The company has recently established eight agencies in the Middle West, South, and Pacific Coast.

## Plan to Change State Regulations

Amendments Include Increased Taxes, Headlight Glare, Mirrors, Better Brakes

NEW YORK, Jan. 29—Many changes in the automobile laws, both objectionable and favorable, are being considered by the various State legislatures now in session. The increasing number of automobiles has been responsible for a number of changes in the examination of applicants for licenses. In some cases these are most stringent, with the purpose of further safeguarding life. Along these same lines are bills further restricting the use of glaring headlights, requiring every motor vehicle to be provided with good brake and horn, and the use of mirrors.

The need of good roads and their upkeep has been the means of some drastic automobile and commercial vehicle bills being passed or suggested. Last week the Hewitt bill in New York State was reported favorably by the assembly and senate committees. This bill places a severe tax on motor trucks, omnibuses, taxicabs and rented cars.

It is expected that the license fee for automobiles in Illinois will be increased at the present session of the legislature.

Pennsylvania is contemplating a complete change in its automobile laws. According to amendments there will be but one law for automobile owners and every operator will be forced to take an examination and must have a driver's license. Dealers' fees are to be increased from \$10 to \$15; the power of headlights fixed and their light is forbidden to rise above 42 in. from the surface on which the vehicle stands; and the exceeding of 24 m.p.h. is to be prima facie evidence of recklessness.

### Headlight Provisions

The headlight question is receiving much attention by the Connecticut legislature at its session. All motor vehicles are to have their headlights regulated so as not to rise above 42 in. from the ground and the glare shall not extend over 100 ft. ahead of the vehicle. A limit to the loads that trucks may transport over the State roads is also proposed. Among other proposed changes are heavier penalties and jail sentences in most cases for negligent drivers with especial severity to those who drive while intoxicated, and more stringent examination of applicants for licenses.

Delaware promises to straighten out some kinks in its automobile law. Some of the provisions include the requirement of a good brake and horn, or other signal device; State licenses for all drivers,

except those operating ambulances and fire department vehicles; exempting from taxation as personal property any licensed motor vehicle; requiring the use of mirrors; requiring all vehicles other than motor vehicles to carry one white light at night, visible ahead and in the rear; and prohibiting any municipality passing or enforcing any law in conflict with the State automobile law.

### New York Motor Truck Bill Passed by Assembly

ALBANY, N. Y., Jan. 31—The Hewitt-Evans bill imposing a graduating tax on motor trucks and buses was passed today by the Assembly, the Republicans voting in its favor by 81 to 34.

The bill will be sent to the governor for his signature to-day, so that the new tax may be levied to-morrow.

Yesterday the bill was passed in the Senate by a vote of 29 to 14, the action being taken after the most extended and heated debate of the 1917 session.

The authors of the bill claimed it would result in an increased revenue of \$600,000. Motor truck interests opposed it as it was burdensome, because trucks are already taxed as personal property up to 2 per cent of their value. The increase totals in some cases up to 1400 per cent.

### Connecticut Jitney Rule Illegal

HARTFORD, Jan. 27—Connecticut courts have declared the jitney ordinance of Norwalk unconstitutional and in conflict with the State motor vehicle law. These decisions are expected to affect the validity of jitney regulations in other Connecticut cities.

Scheidler, a Norwalk jitney driver and owner, refused to procure license for himself as operator or for his car as a jitney in addition to the State license, and was arrested. He was fined in the city court and appealed. Judge Scott in the criminal court of common pleas sustained the appeal on the ground that the Norwalk ordinance conflicted with the State and federal constitutions and with the State motor vehicle law. The case was carried to the supreme court and the appeal again sustained.

### Chicago Truck Owners Talk Fenders

CHICAGO, Jan. 30—Probably the most vigorous protest against Chicago's truck-fender ordinance will be lodged Thursday with the chief of police in answer to his call for a meeting of the truck owners of Chicago to determine how long it will be before they can equip their trucks with the fenders demanded by the present ordinance. It is expected that 300 representatives of the commercial vehicle users in the city will be present to show the impracticability of the fenders called for.

## One Law for Pa. Drivers

All Operators To Be Examined  
—Driver's License Required  
—Dealer's Fees Increased

HARRISBURG, PA., Jan. 27—According to future amendments to the general automobile act of 1913 in this State, there will be but one law for automobile owners and every operator will take an examination and must have a driver's license.

No longer will cities make or enforce their own regulations or boroughs enact their own ordinances concerning the speed and conduct of automobiles on their streets. The Highway Department, which has brought these amendments before the Legislature now in session, proposes to wipe out all existing community legislation on the subject and to impose a uniform set of regulations.

By the new law the dealer's fees are increased from \$10 to \$15; the power of headlights fixed, and light is forbidden to rise above 42 in. from the surface on which the vehicle stands, the horn-blow sign provision is eliminated, and exceeding of 24 m.p.h. is to be prima facie evidence of recklessness.

No license will be valid under the new law until the driver's signature and photograph are attached.

One effect of the amendment will be the elimination of pull now exerted so effectively in behalf of owners who happen to be arrested. The new amendments provide that all information for offenses committed by automobile owners or users shall be brought under the act of Assembly, and not before a Magistrate or Justice of the Peace. They make a violation a misdemeanor, whereas in a great many cases at present drivers are merely called to answer to a charge of breach of police regulations or of a city ordinance.

### \$5,000 Bond for New York Owners?

ALBANY, N. Y., Jan. 26—All automobile owners, according to a bill, must accompany their applications for registration with a bond to be approved by the Secretary of State, in the sum of \$5,000. This is to cover payment of any judgment recovered against the owner in the operation of his car, unless such owner shall state in his application that he is insured in an equal amount in an insurance company. The bill was introduced by Assemblyman Abner Greenberg of New York.

### Dimond Takes Detroit Representation

NEW YORK, Jan. 29—The Dimond Motor Car Co., this city, Apperson and Singer distributor, has taken on the Detroit car.

## 55,000 1917 Cars for Maryland

Increase of 15,000 Expected in 1917—Show a Success—Territory Very Prosperous

BALTIMORE, Jan. 27—Maryland will have 55,000 cars in 1917, an increase of 15,000 over 1916. This was brought out at the Baltimore show, which closed tonight at the Fifth Regiment Armory after a 5-day exhibition which was the most successful in point of attendance, sales and prospects developed of the eleven shows held here.

The Baltimore territory, which includes the State for some dealers and seven counties for the majority, the others being handled in the most instances out of Philadelphia and Washington, plans to use between 30 and 45 per cent more cars during the coming year than in 1916. The registration for 1916 shows 39,419 passenger cars, 4445 commercial vehicles and 1755 dealers. In 1915, there were 27,858 passenger cars, 3189 commercial vehicles and 1341 dealers.

This year for the first time the show was exclusively for passenger cars, and fifty-three dealers were represented, showing 221 cars. More than 30,000 visited the show, the big attendance day being 7000, which was Friday. The attendance increased about 15 per cent over last year despite the increase in the admission charge.

### Bank Clearings High

A feature of show week was the holding of truck exhibitions throughout the city by the dealers and the use of a bus to send prospects to all of the show rooms where trucks were on display. The result of this show, commercial dealers say, will be the increase of about 40 per cent to 50 per cent more commercial vehicles in 1917.

Baltimore was never more prosperous than at this time. The bank clearings, according to the clearing house, for 1916 was \$2,206,338,952, an increase over the preceding year of \$372,689,955, the clearings for 1915 being \$1,833,648,997.

Although the last government census showed Baltimore to have a population of 558,485, the city authorities now place the population at 595,000. Big corporations have established plants just outside of the city limits, and millions of dollars have been invested. Charles Schwab of Bethlehem Steel will spend \$50,000,000 at Sparrows Point in improvements and general construction on the Maryland steel plant, which is now known as the Pen-Mary Steel Co. J. E. Aldred, the New York financier, is heavily interested in Baltimore and is

responsible for the location here of the \$8,000,000 aluminum reduction plant. The Prudential, a \$5,000,000 oil company, has erected a \$2,000,000 plant at Curtis Bay. The Standard Oil Co. is spending \$1,000,000 for improvements. All of the railroad companies are expending millions in improving terminals and other shipping facilities. The net result of all of the big capital being invested has been to attract thousands of skilled workers and to improve the pay of many already here. This city is a ready automobile market. Backyard garages have sprung up all over the city and public garages have been increased by at least 10 per cent in number and more than 50 per cent in capacity.

Baltimore's business operations aggregate more than \$1,000,000,000, with manufactures leading. Clothing alone showed \$40,000,000. Copper, tin and sheet iron amount to \$30,000,000, and slaughtering and meat packing \$20,000,000. The jobbing trade of Baltimore, not including commission business, reached \$300,000,000, dry goods, clothing, boots, shoes, hats notions and millinery being the chief items.

### 48,923 Farms in Maryland

There are 48,923 farms in Maryland. A compilation of the crops for the last year for the chief staples—corn, wheat, white potatoes, hay and tobacco—places the value above \$80,000,000. Baltimore is to have a farm loan bank, and this will bring more farmers into the city than ever before.

More than a score of new automobile companies have come into existence in Baltimore during the past year. One of the most noteworthy features for the trade was the creation of a real Automobile Row along Mount Royal Avenue. Besides this, there have sprung up all over town new garages and accessory firms.

### Mulford To Be with Hudson

DETROIT, Jan. 27—Despite many reports to the contrary, Ralph Mulford will be the star driver for the Hudson racing team this coming season. Mulford did consider the purchase of a Peugeot car and expected to race it himself, but has reconsidered and will continue with the Hudson company and will retain his berth on the engineering staff of that company.

### Stutz Builds Sixteen-Valve Engine

NEW YORK, Jan. 29—In THE AUTOMOBILE for Jan. 4 it was stated that the sixteen-valve engine used in the Stutz car was a Wisconsin engine. This engine is entirely of Stutz design and is built at the factory of the Stutz Motor Car Co. in Indianapolis.

## Plan Intercity Team Contests

New York, Chicago, Indianapolis and Detroit Delegates Outline Reliability Runs

CHICAGO, Jan. 29—Reliability contests in which teams from the major cities will compete probably will be instituted this summer as the result of a meeting held to-day at the Chicago Automobile Club, which was attended by representatives from automobile organizations of New York, Chicago, Indianapolis and Detroit, as well as by Chairman Kennerdall of the contest board of the American Automobile Assn. and Alfred Reeves, general manager of the National Automobile Chamber of Commerce.

The contests will be like the interclub contests originated by the Chicago Automobile Club, and which are semi-annual affairs between that organization and the Chicago Athletic Assn. For the intercity contest it is expected that each city will enter teams of from five to ten cars, penalties being assessed for lateness, etc.

According to present plans, the intercity run for this year will be a 3-day affair, starting from Buffalo early in August. A committee consisting of one representative from each city entering is to be appointed, with S. E. Hibben of Chicago as chairman. Representatives of the following cities have pledged teams, and their committee representatives are: Indianapolis, H. H. Rice; New York, C. G. Sinsabaugh; Detroit, W. S. Gilbreath; Buffalo, Dai Lewis. In addition, it is expected that Boston, St. Louis, Pittsburgh and Toledo will enter teams. Aside from those mentioned, representatives at the meeting included Ray Owen, W. E. Metzger and F. E. Moscovics.

### N. A. A. J. Elects Faeth President

CHICAGO, Jan. 27—The National Assn. of Automobile Accessory Jobbers this week put the finishing touches on its organization. The association is but 18 months old, but whereas a mere dozen men attended the first meeting in the Florentine room of the Congress Hotel at that time, nearly 400 were present at this week's session.

Charles E. Faeth of the Motor and Machinists Supply Co., Kansas City, was elected president to succeed Sidney B. Dean, St. Paul, and it was voted to hold the next meeting in Hot Springs the first week in June. The last spring meeting was held there. The 1918 spring meeting will go to the Pacific Coast, probably to San Francisco.

The most important single thing that came up was the work of the jobbers in trade betterment. There is a big com-

mittee with a member from each State which is aiding the dealers and garage-men in forming local and State associations and in adopting better business and accounting methods and in becoming better tradesmen in many ways.

National Show Mgrs.' Assn. Formed

CHICAGO, Jan. 30—The National Automobile Show Managers' Assn. was organized here to-day by representatives of thirty-five dealer-associations from the Central West territory. E. E. Peake, secretary and treasurer of the Kansas City Motor Car Dealers' Assn. and manager of the Kansas City show, was elected president of the new association. B. J. Ruddle, assistant secretary of the Milwaukee Automobile Dealers, was elected vice-president and Ray W. Sherman, of Motor World, was elected secretary and treasurer.

Tampa May Have Speedway

TAMPA, FLA., Jan. 26—The local automobile owners are agitating the development of interest sufficient to enable the construction of a speedway on which to employ drivers during the winter months. Now that there are no more Ormond meets the reversion to automobile racing as a winter amusement along the coast is quite to be expected.

Bosch Contracts with 15 Companies

NEW YORK, Jan. 28—The Bosch Magneto Co., this city, has signed contracts with fifteen concerns in the automobile and commercial vehicle fields to use Bosch magnetos for the coming season. They are as follows:

- Nelson & LeMoon.....Chicago, Ill.
- Maccar Truck Co.....Scranton, Pa.
- F.I.A.T.....Poughkeepsie, N. Y.
- Old Reliable Motor Truck Co....Chicago, Ill.
- Indiana Truck Co.....Marion, Ind.
- Lange Motor Truck Co.....Pittsburgh, Pa.
- Zeitler & Lamson Truck Co.....Chicago, Ill.
- Federal Motor Truck Co.....Detroit, Mich.
- Erennan Motor Mfg. Co.....Syracuse, N. Y.
- Watson Wagon Co.....Canastota, N. Y.
- Continental Truck Mfg. Co....Superior, Wis.
- Erockway Motor Truck Co....Cortland, N. Y.
- Eastern Motors, Inc.....Hartford, Conn.
- Kent Motors Corp.....New York
- Brinton Motor Truck Co....Philadelphia, Pa.

May Revive Elgin Classic

Tentative Plans for Holding Road Races—To Be Championship Event

CHICAGO, Jan. 29—Tentative plans for the revival of the Elgin road race this year were made to-day at a meeting of Elgin representatives with representatives from the Chicago Automobile Club, the Chicago Speedways Assn. and Chairman Kennerdall of the contest board of the A. A. A. If the decision is made to hold the race this year it may be made a championship event.

Van Speedometer Equipment on Three More Cars

CHICAGO, Jan. 26—Van speedometers have been made stock equipment on the Wolverine of Toledo, New Era of Joliet, Ill., and the Pennsy, Pittsburgh, Pa. The Drummond, Hal 12, Jeffery, and Princess use Van Sicklen speedometers and stock equipment, in addition to the cars with this equipment in the specification tables of the issue of Jan. 4.

Decoration Day Meet for Kansas City

KANSAS CITY, Mo., Jan. 29—The Kansas City Speedway and Exposition Assn. will hold a meet on Decoration Day. It is now building a temporary grandstand.

Garford and Gramm-Bernstein Make New York Changes

NEW YORK, Jan. 29—The Garford Motor Truck Co., Lima, Ohio, has reorganized its eastern distribution system. Beginning to-day the local office became a factory branch, under the management of Rodney Hallam. Brooklyn, Newark, eastern New York, northern New Jersey

and New England sales will also be handled from the local office. C. B. Harvey returns from Philadelphia to take charge of the sales organization.

The R. E. Taylor Corp., formerly handling the Garford trucks in this territory, is now distributor for the Gramm-Bernstein trucks in the East. The company will control sales on the Atlantic coast from Maine to Maryland.

N. E. Smith Form-A-Truck Holds Convention

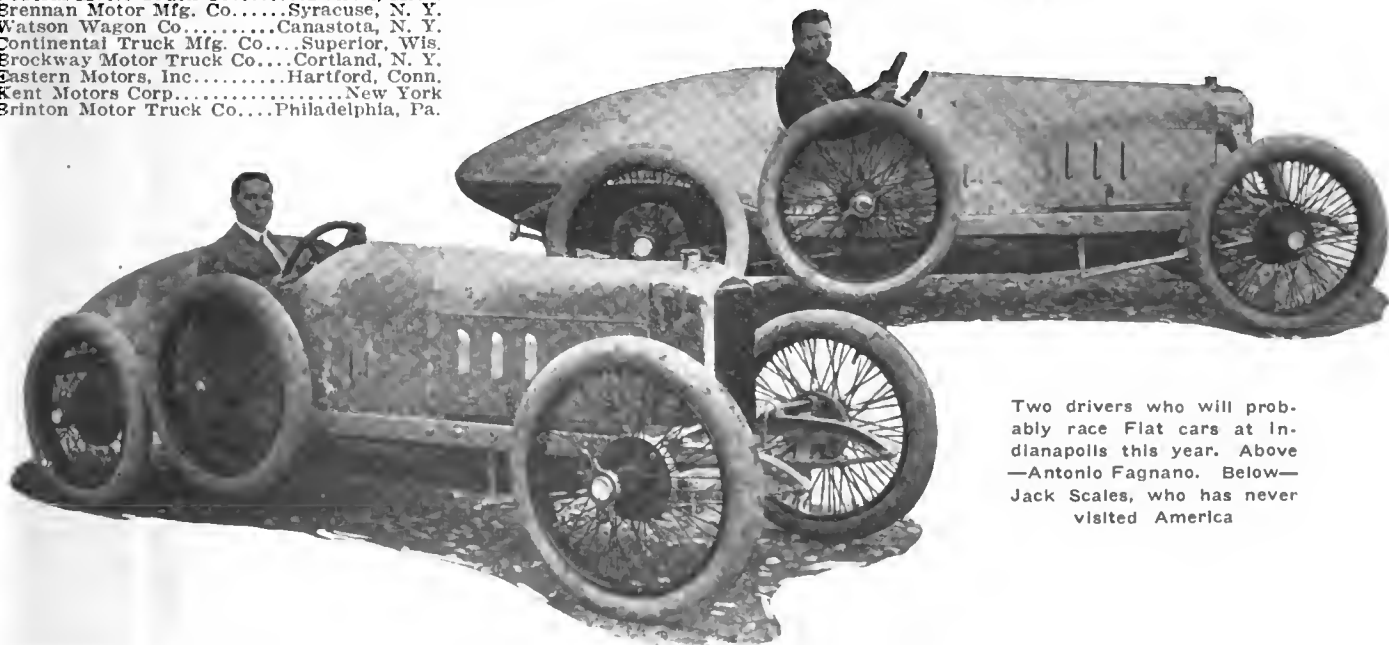
BOSTON, MASS., Jan. 27—One of the events of the week here was the convention of the New England Smith Form-A-Truck dealers called by John L. Judd, the New England distributor. He had as guests from the factory E. M. Elliott, general eastern sales manager, and J. D. Davis of the Commerce Trust Company of Chicago. After 2 days of conferences there was a banquet at the Westminster at which Mr. Judd presided and more than 100 were present.

New Offices for Silvex

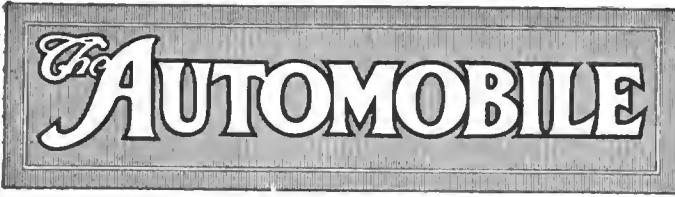
SOUTH BETHLEHEM, PA., Jan. 27—The Silvex Co., manufacturer of Bethlehem spark plugs, is preparing to remove its sales organization, advertising department and general office forces away from the factory and into a separate office building at South Bethlehem.

Resta Receives Bosch Trophy

CHICAGO, Feb. 1—Presentation of the Bosch trophy and cash prizes for 1916 was made at the Chicago Automobile Club to-day. Resta took first place with 4100 points. The other winners were Aiken, with 3440 points, and Rickenbacher, with 2910. The prizes for 1916, which are offered again this year, are a \$1,000 silver cup and \$1,000 cash for first place, \$1,000 to second place and \$500 to third place.



Two drivers who will probably race flat cars at Indianapolis this year. Above—Antonio Fagnano. Below—Jack Scales, who has never visited America



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## Spreading Output

**I**N times like these when the question of disposing of cars is not generally one which is any worry to the factory sales manager, the question of distribution assumes a new angle.

Occasionally it is the custom of distributors to arrange for a percentage of the factory output regardless of the exact number produced. Where the output is small it is not desirable to carelessly make contracts of a limiting nature such as this. The manufacturer must look ahead to times that will not be as prosperous as these and instead of concentrating his output on a single locality, he should aim to spread it over the most advisable area.

The question of selecting more dealers is not so pertinent now as that of selecting better ones. At the Chicago show there is a direct reflection of this. Instead of seeing all the manufacturers anxious to sign up new dealers and new territories it is more a question of getting better dealers and better territories.

Manufacturers of popular-priced cars whose output is still limited to modest figures are avoiding the concentration of a large part of this output in a single territory. On the other hand, there must not be too wide a spread or the proper service will not be given. It takes a certain number of cars in a given territory to support a service station. The number sold, therefore, should at least exceed this minimum figure. If it is the plan to nationalize the

product and to open for the future the widest field of endeavor, however, the manufacturer must see that he does not darken the map with one or two black spots representing his sales area, but rather that as many desirable fields as possible with his put are covered.

## Presidents in Foreign Trade

**W**HETHER or not the United States is to be a great exporting nation and build up a world commerce was a subject that 1250 delegates at the convention of the National Foreign Trade Council last week could not settle; but it was apparent from all sides that nearly all of these 1250 delegates were much interested in foreign trade. There were a few other things quite apparent at the convention: One was that the automobile industry was hopelessly poorly represented by managers of concerns, presidents and others who should be deeply interested in the national aspect of the export problems. Their export managers were present, but the head officials should have been present. The head officials in many other industries were present in goodly numbers. Those in the automobile industry were conspicuous by their absence.

The convention proved that we are badly in need of certain national reforms before export trade will be as easy for us as it is for some other countries. All European countries have discovered how essential it is to co-operate nationally in export trade. We yet have to learn this lesson. The present Webb bill, now before the Senate committee, has been pushed to its present position with the hope of legalizing co-operation among our manufacturers in export trade—to free them from the restrictions of the Sherman law.

The Webb bill requires pushing along; it should be passed by the Senate this year. The President favors it. Whatever pushing it gets should come from the head officials of our automobile companies and not from our export managers.

For export trade we need a few more ships than we have at present. The convention told how our Pacific Ocean trade has dwindled to a hopeless phantom while Japan's has risen to enormous proportions. We were told how our government hampers our American shipping by various laws, costly crews and in other ways. This is information for our presidents rather than export managers.

Another political feature of foreign trade is our present tariff. The convention voted that we must have tariff changes. We must have a bargaining tariff which we can raise or lower to meet the measures adopted by foreign countries. At present we can lower our tariff schedules but cannot raise them. This is a serious handicap in these days when our automobiles are being barred from several countries and when we can expect any day to find trade barriers built higher and higher by foreign governments. To get a bargaining tariff we have to work politics, which is not what our export managers are hired for. That is work for our presidents, our secretaries, our directors and stockholders.

# Chicago

## World's Greatest Distributing Show

By David Beecroft

CHICAGO, Jan. 27—The seventeenth annual automobile show which opened this afternoon in the Coliseum and armory, has by its big attendance and good exhibits demonstrated once more that the industry is not halting because of war or rumors of peace. The same buoyant and optimistic atmosphere which has pervaded the Chicago shows for years is here to-day and, although opening day is largely paper day, the crowd to-night was up to that of any previous year in buying caliber. The wealthy people have not been in the show to-day—they never are on the opening day—but dealers are all looking for a greater turn-out of them than last year.

It is not expected that the show will mean very heavy retail sales—it never does—but more money is being expended in advertising by the exhibitors than formerly and the city is already full of out-of-town people. Automobile show week is the biggest week of the year with Chicago theaters and hotels and this year will be a little more so than formerly. It is the greatest automobile advertising week of the year for the industry.

Sam Miles always gives a good show from the decorative viewpoint and this year is no exception. The scheme follows more or less generally that of former years, but the colors are a little darker and the effect correspondingly richer. Red and browns predominate. The scheme is that of an old English castle. The object is to give illumined art glass effect. There are two rows of pillars in the Coliseum, each bearing a huge globe of canvas so made and lighted as to give the effect of many-colored glass. The ceiling has many large panels also illumined as to give the glass effect. Finally the shades over the electric lights are art glass imitations.

### Bigger Than 1916 Show

Numerically the show is a little bigger than last year, as there are ninety-two car exhibitors as compared with eighty last year; and there is a total of 324 cars and chassis as compared with 294 a year ago. The cars occupy practically the same

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*92 Car Exhibitors, Compared with 80 Last Year, Indicate Industry's Growth.*

*324 Cars and Chassis, or 30 More Than Exhibited at Chicago in 1916.*

*Four New Cars in Coliseum and Armory—Stephens, Hassler, Chicago Six and Classic.*

*A New Racing Car, the Disbrow, at the Salon. Fageol Also Shown.*

*Only Four Electric Makes on Display—Woods Dual Power in Gasoline Car Class.*

*Custom-Made Bodies Show Increasing Popularity in Many Western Cities.*

*Accessory Exhibits Representative Though Handicapped by Lack of Adequate Space.*

*Show Brings Out Distributors' Problems in Storing Cars Over Winter.*

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parts of the various buildings as formerly and the exhibit of show cars is much the same as seen in New York. There are very few different show cars here, a few examples being where local dealers have specially finished jobs, the sale of which has increased very much in Chicago during the past year.

Ten years ago the Chicago show was generally quite a different one from New York. Then there were a dozen or more makes not seen in the East. Year by year has seen the number of new cars here reduced until this year there are not more than three or four cars not seen at the Grand Central Palace. The new cars here are the Stephens, Hassler, Chicago six and Classic. To this might be added two new jobs at the Salon which is being held in the Congress hotel, where the luxurious Fageol and the new Disbrow racing job are shown.

Chicago has long held a premier position as having the leading display of electrics, the exhibitors numbering many more than seen in New York. In this respect conditions are changing and what is known as Electric Row along both sides of the center aisle of the armory has lost much of its exclusiveness. The aisle has been invaded by gasoline makers, who have taken the place of electrics that have dropped out and this year there are only four electric makes shown, Detroit, Ohio, Milburn and Baker-R & L.



Above—Coliseum from the north balcony. Note the art glass panels along the sides and detail of ceiling done in brown and fawn tapestry effect. The immense pillars are a dark brown shade surmounted by huge globes.

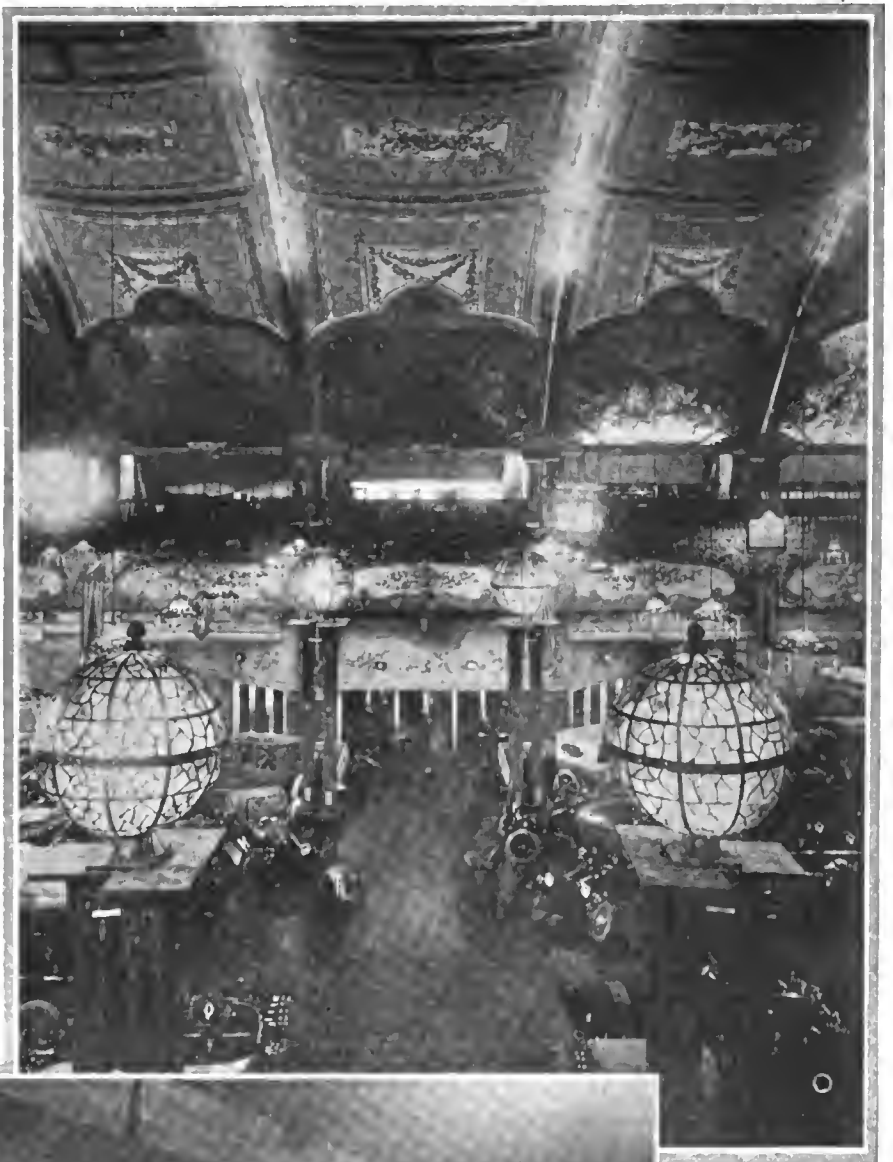


Coliseum taken from midway west balcony, showing detail of art glass panels and globes. The globes are bronze and light brown, and harmonize effectively with the ceiling and pillar color schemes.

# Old English Castle Is Chicago Show Setting



Entrance to Coliseum from east balcony of main room showing broad central aisle. Note the impressive effect gained by providing a wide passage way and the pleasing arrangement of exhibits on either side



View of Armory taken from north-east balcony. The general scheme of decoration is in accord with that in the Coliseum with tall pillars surmounted by globes. Electric cars are being shown in this building



Woods, which since the inception of the automobile industry has been an exhibitor in the electric field, is still on Electric Row, but with its new gasoline-electric car, which does not fall in the electric classification. It is an interesting coincidence that the Woods chassis exhibited for the first time occupies the identical exhibit space in the armory which the Knight sleeve-valve chassis occupied many years ago when it was first exhibited at an automobile show. The Knight job has made its progress and it will be interesting to follow the development of the gasoline-electric movement during the next few years.

#### Accessory Displays Scattered

The Chicago show is never as strong in accessories as New York, although it should be a greater one. Here the accessories are scattered in places where cars cannot be placed. You find them forming a ring around the four sides of the Coliseum gallery, the second floor of the Coliseum annex is filled with them, there are a few in the basement of the Coliseum annex and the remainder are strung around the narrow four sides of the gallery in the armory. It is unfortunate that Chicago has not such a compact method of displaying accessories as the two upper floors of Grand Central Palace in New York afford. Had Chicago the space, it would stage the greatest accessory show in the country. There is more buying at Chicago than at New York; there are more dealers present and the accessory business is handicapped by a lack of space.

There are not many new accessories, here again the Chicago show not displaying that array of accessories not previously seen that it boasted of in former years.

There are two new Solar products, a windshield spotlight with an adjustable mirror, a switch on the lamp and universal focusing and adjusting devices. There is also the Duplex headlight which gives a city and country lamp in one. The Jackson electric valve grinder is new, as is also the new Kemco Ford starter and some of the Halladay handy products such as a suitcase and package carrier. The new accessories are confined beyond these to little handy devices that would hardly be furnished as regular equipment on cars but are important for the owner.

#### Makers Neglect Chicago Show

The Chicago show is not taken advantage of by many automobile manufacturers as thoroughly as it should. The makers concentrate more on New York and leave Chicago to the sales managers, the advertising managers and the dealers. Two big shows in a month are too much for many makers. This is to be regretted because there is a general feeling among the large Chicago distributors and in such other big distributing centers as Minneapolis, Kansas City, St. Louis, Omaha, Denver and the Pacific coast cities that the makers do not keep close enough to the distributors and through them with the buying public.

A general canvass of the Chicago distributors brought forth this conclusion to-night. Like dis-

tributors in other centers mentioned there are many ways in which makers and distributors should be closer together and the Chicago show offers a good opportunity for this. From A to Z there has been a shortage of closed cars during the past 6 months and Chicago distributors have concluded that often the makers have not adequately gaged the increasing demand for closed types.

Production has so engrossed the maker for nearly 2 years that he has only had eyes for standard types of open jobs. Closed jobs have gummed the factory machinery a little too much.

To-day the distributor has a legitimate right to be heard on this question: There are two sides to it, the maker and the distributor, and while the maker worships production of an open model the distributor wishes otherwise. The distributor cannot sell the open car throughout the country territory in the winter months beginning Dec. 1, and running, perhaps, to March 15. In the Illinois territory, and the same applies to many other territories, the roads are generally too bad in these months. The agents cannot sell cars and the distributors generally agree with them. This means a very general stopping of the movement of open cars in these months which necessitates the Chicago distributor storing cars in large numbers for quick delivery around April 1. Distributors agree in that it is very difficult for them to get country agents to store cars; a few say they can average one car per dealer, but generally the country and small-town banker has not taken keenly enough to the question of financing the local dealer. The dealer has not enough money to pay outright for two, three or four cars. He has hesitated to go to his banker, and as a result the distributor has had to carry the load.

#### Distributors' Heavy Storage Expense

And it is no small load that these Chicago distributors have to carry by way of winter storage. Some distributors are storing 300, others 400; a few 500 and there are rumors that some are storing nearly 750 cars. This storing costs money and the distributor has to carry the entire expense. Several distributors agree that it takes between \$35 and \$45, average, to carry a stored car worth \$1,500 for 3 months. Storage last year was \$2 per car and now it is \$2.50 per car per month. Besides storage there is interest on the money advanced by the banker, and there is also insurance, as well as the many expenses connected with placing cars in storage, taking them out, and other incidentals.

Chicago distributors are emphatic in their conviction that the maker should give some assistance in carrying this storage load. They suggest some fifty-fifty division. The maker, they believe, should give an additional discount of perhaps \$20 to \$25 per car for all open types delivered in December, January and February and perhaps part of March. This problem has not been put up to the makers in a united manner, but it will be surprising if another season does not see some compromise of this nature advanced.

The distributors take these winter cars and store them as an accommodation to the maker, and it is a real accommodation, chiefly as he gets his draft against bill of lading. It is this co-operation of distributors that has made this winter delivery possible, and the maker has not carried a single bit of the load. It has all been shouldered on the distributor.

**Develop Closed Car Market**

So far as city trade is concerned the dealer does not object so seriously, but with rural trade in the Chicago territory there is an almost complete cessation in the winter season as mentioned. With the retail city trade sales are being spread over the 12 months much more uniformly. The dead Novembers, Decembers and Januarys of a few years ago are now wanting, and while these months cannot be compared with spring months they retain the sales forces. This has been largely due to the heavier sale of closed cars, which as yet has not invaded the country. In the Chicago zone the closed car is gaining in such cities as Springfield, Ill., but as yet has been little taken up in such cities as Rockford, Decatur, Peoria, Bloomington, Ottawa, Streator, Danville and La Salle, to which might be added other centers like Elgin, Aurora, etc.

Still another handicap the distributors are generally complaining of is that the makers do not give them all of the cars they are contracted for in August and September, but deliver some of these in November, December and often in January. This requires that the distributor spend \$35 or \$45 on each, carrying them over for spring delivery. So far the maker has not offered to even pay winter carrying charges, which it would seem is his legitimate obligation.

Reverting to the closed car business; it will bear repeating that Chicago distributors generally agree that manufacturers have not adequately awakened to the possibility of the closed car. There has been a most general increase in this field. One distributor has placed 250 convertible winter jobs in this city this season, whereas formerly he never placed 100. This distributor got good shipments because his factory was not able to give eastern cities their quota owing to railroad shipments and difficulty of getting railroad cars into the Atlantic seaboard territory.

Distributors are strong in their stand that if the maker were to keep closely in touch with them, and consult them more on matters of car demand, there would be more recognition given to the closed car market. This market appeals to the dealer who has to pay the same rent in December and January that he has to pay in June. In the

winter months his lighting bills are heavier and other expenses increase. To meet these obligations he wants to sell cars every month in the 12. He sees in the closed car field possibilities which will make it possible to deliver as many closed cars in the fall and winter months as open cars in the medium late summer months. It only requires due recognition of this on the part of the maker, and arranging his manufacturing program of closed cars to give them when the distributor wants them.

Another developing tendency of the automobile market as observed in the Chicago territory for the past 2 years is that of giving buyers wider color options, but placing a price on the extra work. Overland and Cadillac were leaders in this movement a year ago and within the last year several other big distributors have fallen in line. The Hudson distributor has added a paint and finish department and is already flooded with work. Other distributors, instead of adding their own departments, have the work done by contract.

There is one example in the show of the small Oakland which has nearly \$600 added to its stock price by way of special color, six wire wheels, two extra tires, a smart victoria hood, special slip covers, and a few other luxuries.

Manufacturers will find it to their advantage to investigate very generally what has been done and what is being done in this field. It portends a demand for more color and while makers will want to limit standard prices to the sombre black, solely for production, it may be that a few makers taking up this color subject will get the jump on a certain field of sales.

**Get Into Stone Road Movement**

It will be a good investment to the American automobile makers to get more actively into the stone road movement for central and southern Illinois and in some other wealthy sections of the great agricultural zones of the Mississippi valley. It is deplorable that central Illinois with farm property worth as high as \$250 per acre and in some cases higher, should have roads that cannot be used for three and in some cases four months of the year. Stone roads would have an astonishingly stimulating influence on winter sales in Illinois. Here is a place where makers and distributors should work hand-in-hand, and it may be where the work should be well backed by the manufacturer, but all work on the firing line should be done by the distributors who could marshal their sub-agents for such work. It is just as essential to get stone roads in central Illinois to stimulate winter sales as it is to have full-page display advertisements during show week. Good roads may not appeal so spectacularly, but they are no less potent.

STATISTICS OF CAR AND CHASSIS EXHIBITS AT CHICAGO SHOW

EXHIBITS		BODY TYPES—OPEN CARS		BODY TYPES—CLOSED CARS				
	1916	1917	1916	1917	1916	1917		
Car manufacturers.....	80	92						
Total number cars and chassis	294	324	Five-passenger .....	64	75	Coupe .....	7	14
Stripped chassis .....	52	50	Six and seven-passenger.....	57	54	Sedan .....	10	26
Four-cylinder .....	106	101	Two-passenger .....	33	21	Demountable top .....	18	9
Six-cylinder .....	135	164	Three-passenger .....	23	9	Cabriolet .....	2	0
Eight-cylinder .....	42	41	Four-passenger .....	10	47	Limousine .....	10	12
Twelve-cylinder .....	11	18				Landaulet .....	1	0
Total .....	294	324	Total .....	187	206	Town Car .....	5	1
						Berline .....	2	1
						Total .....	55	68

# Four New Cars Appear at Chicago

Stephens, Hassler, Chicago and Classic Are Entirely New Chassis—Cars Not Shown at New York Include Glide, Maibohm, Monitor, Dixie and Woods Dual Power

**F**OUR new cars are making their first appearance at the Chicago show. None of these represent anything radical, all being assembled from standard units and of conventional design. The four are the Stephens, which is made by the Stephens Motor Branch of the Moline Plow Co., a concern long established in the plow and wagon business; the Hassler, made by the Hassler Motor Co. of Indianapolis; the Chicago light six made by the Pan-American Motors Corp. of Chicago, and the Classic, made by the Classic Motor Car Corp., Chicago.

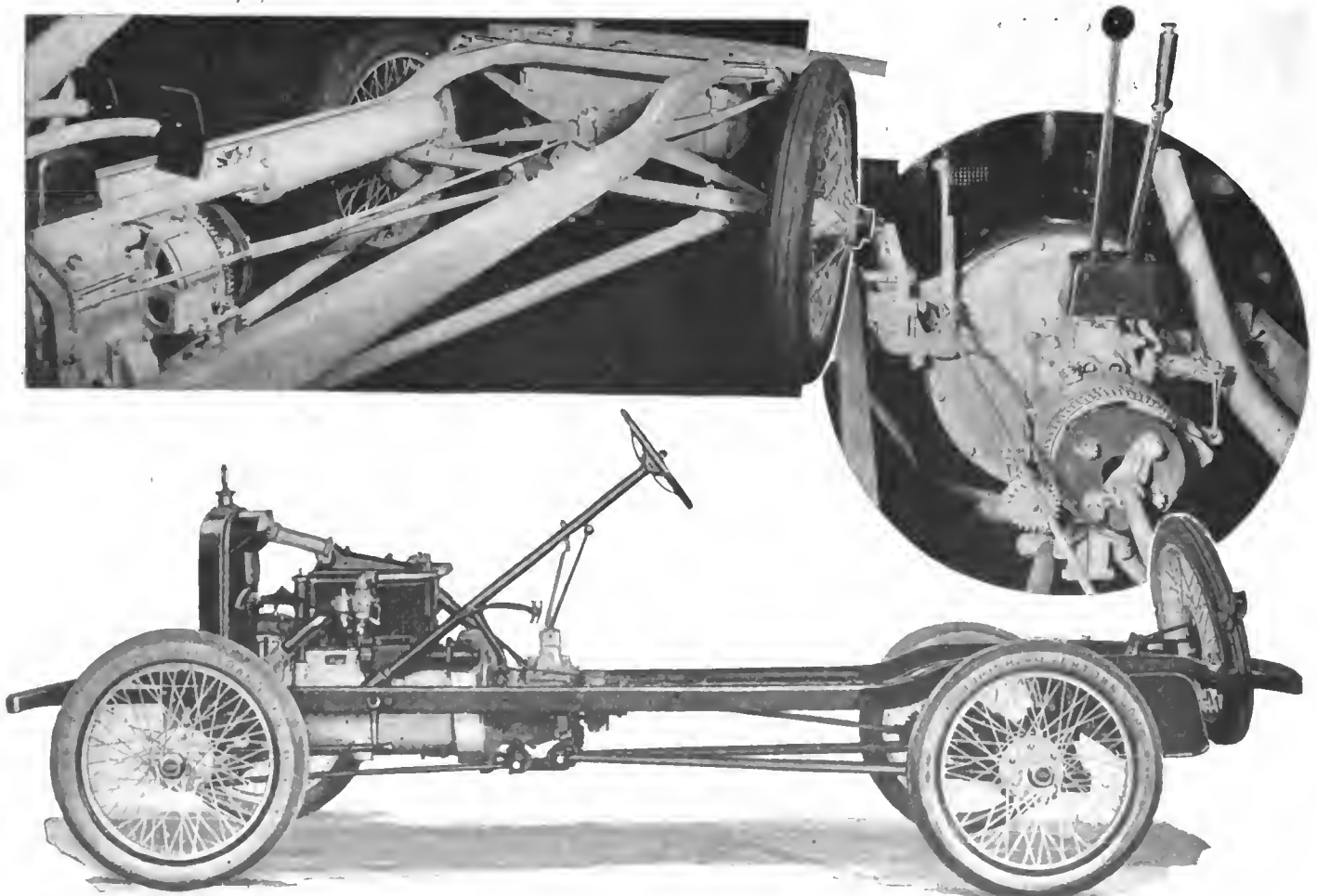
As usual there are a number of cars which were not at New York, the Glide, Maibohm, Monitor, Woods Dual Power, and Dixie are all examples of this. On the other hand some of the New York cars are not at Chicago, but none of the larger manufacturers are missing.

In new bodies there is not so great a variety as has been seen in previous years. Almost without exception the exhibits which were at New York were moved bodily to the Chicago show. Scripps-Booth has a new town car on exhibi-

tion for the first time and the Anderson electric also shows a new body. The Ohio electric has an entirely new model at the Armory, which is a modification of the previous design, without any mechanical changes.

One of the most interesting of the new exhibits is the Stephens six, known as the model 65. It is attracting considerable attention on account of its newness and the fact that it is made by a department of a long-established concern. It represents up-to-date practice in assembled car design incorporating a Continental power plant, Zenith carbureter, Connecticut ignition, Willard battery, Gemmer steering gear, Auto-Lite lighting and starting, and other standard parts. It is made up also in a roadster which is known as model 60.

The Continental engine employed is the standard light six job of 3¼ by 4½ in. Cylinders are block-cast and carry a unit power plant on a standard bell housing. The clutch is a multiple disk automatically oiled from the motor lubrication and hence requiring no attention on the part of the



Details of the new Hassler chassis. Above is a view showing the flexible drive with two Thermoid couplings and the rear cross-spring mounting. At the right is the rear of the power plant, showing the transmission brake and the forward Thermoid coupling. Below these is the side view, showing the radius rods



Above is the Stephens six, one of the four entirely new cars at the show. Cylinders are  $3\frac{3}{4}$  by  $4\frac{1}{2}$  in. and tires are 32 by 4



Above— Scripps-Booth town car with sloping wind shield and separate driver's compartment. This is a new job at the show



Below is the new Chicago light six brought out at the Chicago show. Note smooth lines, wire wheels and sloping wind shield

Ford cars. It has been developed to a large extent by Charles Merz, a well-known racing driver who has been acting as experimental engineer. While it is an assembled car, it incorporates some unique features. Probably the point of note is in the floating drive. This is made up by two double Thermoid-Hardy

driver. The gearbox furnishes three speeds and the drive is taken through a propeller shaft with two universals to a floating rear axle. Both the drive and torque are taken through the rear springs in Hotchkiss style and the springs, in accordance with growing practice, are mounted directly beneath the side members of the frame. The wheelbase is 115 in. and the tires 32 by 4, quick detachable with plain tread in front and the all-weather non-skid in the rear.

disk couplings which are placed at each end of the propeller shaft. Also, in the drive assembly, there are two radius bars which extend from the rear end of the gearbox to points at the extremities of the rear axle housing. In some respects this resembles the Hotchkiss drive, with the addition of the radius members, which are designed to take the horizontal road shocks instead of allowing them to be transmitted through the spring eyes and shackles.

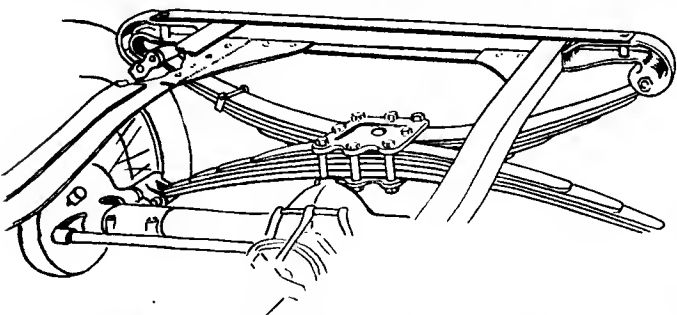
In the matter of equipment, the car is complete at the sales price of \$1,150 f.o.b. Freeport, Ill. The 19-gal. gasoline tank is swung under the side frame members at the back end of the chassis and the feed is taken by Stewart vacuum. There is also a Stewart-Warner speedometer and a Stewart engine-driven tire pump equipped with a pressure gage on the hose furnished as standard equipment, and there also is included an extra demountable rim, trouble lamp, and the usual jack, tools and repair kit.

Heavy volute springs are housed in casings on the under side of the gearbox. Through the inner coils of these springs the radius rod ends are bolted, allowing for a free movement of the rear axle within the limits of the action of these springs.

**Hassler Incorporates Floating Drive**

The standard units of which the car is made up include a Buda four-cylinder L-head block standard engine of  $3\frac{3}{4}$  by  $5\frac{1}{2}$  claimed to develop 40 hp. at 1950 r.p.m. It is the standard Buda product with full aluminum crankcase and helical gear camshaft drive. The carbureter is a Rayfield  $1\frac{1}{4}$  in., ignition by the Connecticut system, with magneto type of distributor, starting and lighting by Auto-Lite in connection with a Willard 6-volt 100-amp.hr. storage battery. The clutch is a Borg & Beck dry-plate design transmitting the drive to a Grant-Lees gearbox mounted in a semi-steel case and equipped with S. K. F. self-aligning double row ball bearings on both the main and lay shafts. The shafts and gears are both of nickel-steel. The drive, as explained, is through the flexible coupling and then to a floating axle which is mounted on Hyatt roller and New Departure bearings. The driving members are chrome vanadium steel and the gears a product of the Brown-Lipe-Chapin organization. The latter are of nickel-steel and provide a direct drive ratio in the rear axle of 3.7 to 1. The springs are transverse X type in the rear.

The Hassler is manufactured to a large extent by the same interests which produced the Hassler shock absorbers for



Transverse X-type rear springs on the Hassler

Gasoline feed is by the Stewart-Warner vacuum system

## New Body Lines in Four Electric Models at Chicago Show



The design of the Milburn taxi shows that the difference in body types of the gasoline and electric cars is rapidly being eliminated. The close resemblance of this body to that of a gasoline car attracted considerable attention



The Woods dual power car uses a gasoline engine connected to an electric motor by a magnetic clutch as its power plant



The Ohio electric coupe model 44 sells for \$2,380, a reduction of \$520 from the price of the previous model, which it closely resembles



This Springfield body on the Detroit electric, adapting the convertible principle to the brougham style, has a rounded front hood similar to the latest type of gasoline car front ends



Maibohm roadster, exhibited at Chicago but not at New York

tremely low center of gravity and bringing the body quite close to the ground.

The chassis construction is simple, with the frame wide at the rear, tapering at the center and parallel and narrow at the front. This permits the two supporting points at the rear of the power plant to be mounted directly on the main frame while providing a wide body mounting at the rear. The rear springs are 57 in. long, semi-elliptic, 2 in. wide. They are underslung, which also has a tendency toward lowering the center of gravity of the car. The axles are Timken. Wheelbase is 120 in. and the tire size 32 by 4.

Gray & Davis equipment is used for starting, lighting and ignition. The storage battery is a Willard and throughout full equipment is used. The body is of a moulded form, with lake blue as the standard color. The running gear wheels and windshield frame are finished in pure white enamel. The price is \$1,250 f.o.b. Chicago, with \$75 extra for a set of Houk wire wheels.

and Houk wire wheels provided with Silvertown cord 33 by 4 in. straight-side tires are standard equipment. The wheelbase is 112 in. and the road clearance is 10 in.

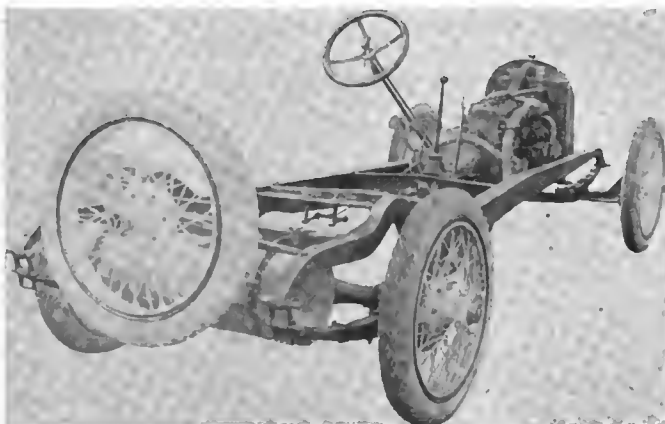
At present a roadster only is mounted on this chassis. It is a roomy style for two passengers with a seat width of 45 in. and a passenger seat mounted slightly behind that of the driver. The body measures 66 in. from the back of the seat to the dash, 32 in. from the front of the seat to the dash and the doors are 24 in. wide. The car is completely equipped with bumpers as standard and a Boyce Motor-Meter and five wire wheels with cord tires included in the purchase price, which is \$1,650 f.o.b. Indianapolis.

**Classic a New Assembled Car**

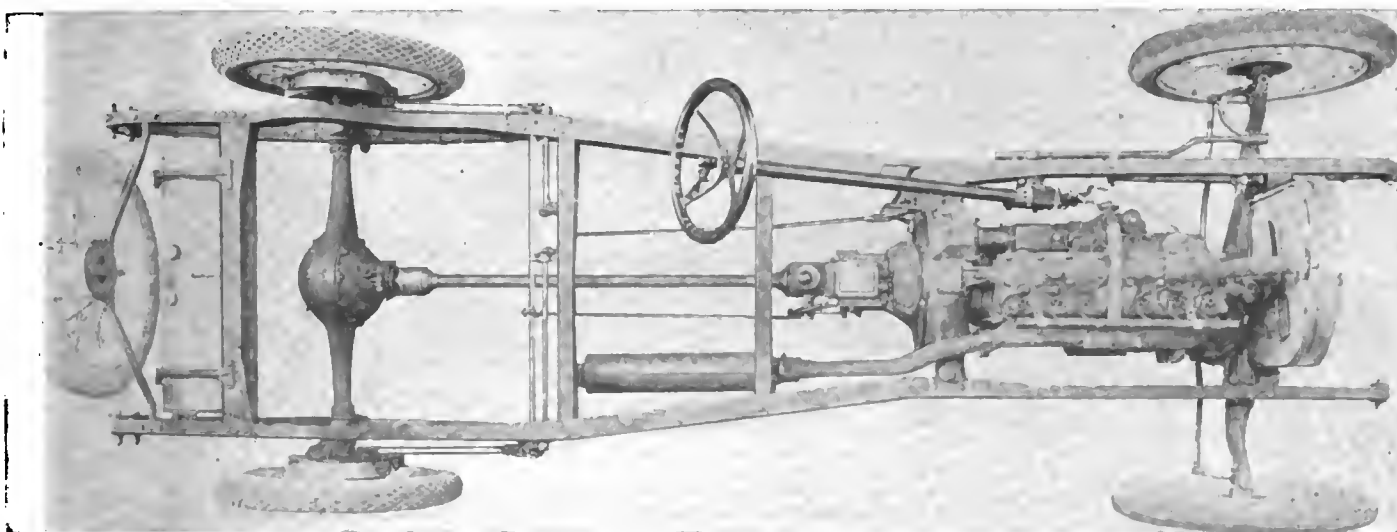
The Classic is an assembled job employing a standard Lycoming 3½ by 5 four-cylinder engine, Borg & Beck clutch, Mechanics' Machine gearbox, Gemco floating axle, Gemco steering, Youngstown radiator, and other well-known standard parts. It has a wheelbase of 114 in. and a tire

**Chicago Uses Double Drop Frame**

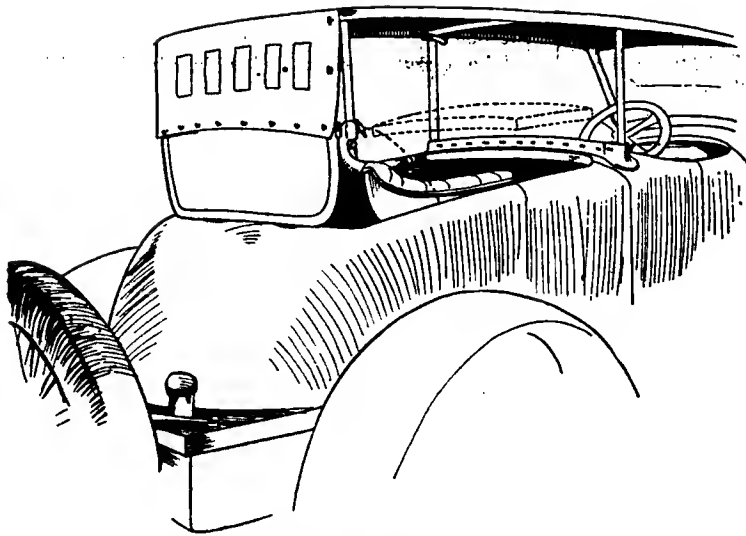
The Chicago light six is fitted with standard parts throughout, assembled in a frame of original design. The power plant is the 40-hp. 3½ by 5 in. six-cylinder Rutenber fitted with a Rayfield carbureter. The gearbox and clutch are a unit with the crankcase, making it a unit power plant, the clutch being a multiple-disk dry-plate type transmitting the drive to a Warner selective three-speed gearbox. The drive is flexible, with both propulsion and torsion taken through the rear springs. The latter are mounted directly beneath the main frame member so that in transmitting the drive there is no twisting stress on the frame. The latter has a double kick-up in the rear, giving the car an ex-



Chicago light six chassis, showing double-drop frame



Chicago light six chassis, showing how frame tapers at the center. Note wide rear allowing wide body construction



On the Paige roadster the rear seat folds into the body

size of 33 by 4. It is sold completely equipped, being provided with a spotlight and bumper, at \$885 f.o.b. Chicago.

**Springfield Body on Detroit Electric**

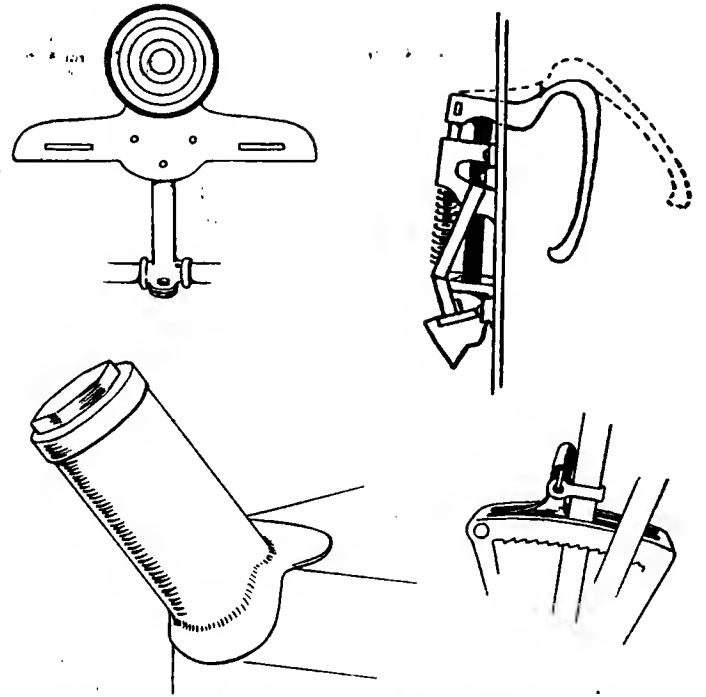
Of the new bodies, probably the most distinctive is the Springfield type body on one of the Detroit electric exhibits. This in an adaptation of the Springfield convertible principle incorporated with the brougham style of body. With the rounded front hood the car resembles a gasoline product quite closely. The part corresponding to the radiator has a high-dome crown effect very similar to the latest type of gasoline car front ends. This new body is fitted to the model 69 chassis and sells at \$1,775 f.o.b. Detroit.

**Scripps-Booth Has a New Body**

A new town car style of body is shown by Scripps-Booth. This body is on the limousine style, with the roof only over the passenger compartment and not over the front or driver's compartment. It is fitted with a sloping windshield and the body line from the dash to the rear of the front compartment is dropped slightly below the line of the passenger entrance door. The trimming and upholstery is in leather in the front compartment and cord for the passengers. The body is relieved by a white trimming line at the point of juncture between the hood and the cowl. There is also a white stripe running over the top of the cowl and along the side line, extending around the body.

**Ohio Electric Shows New Model**

An entirely new model is shown by the Ohio electric. Practically the same as its predecessor, it has



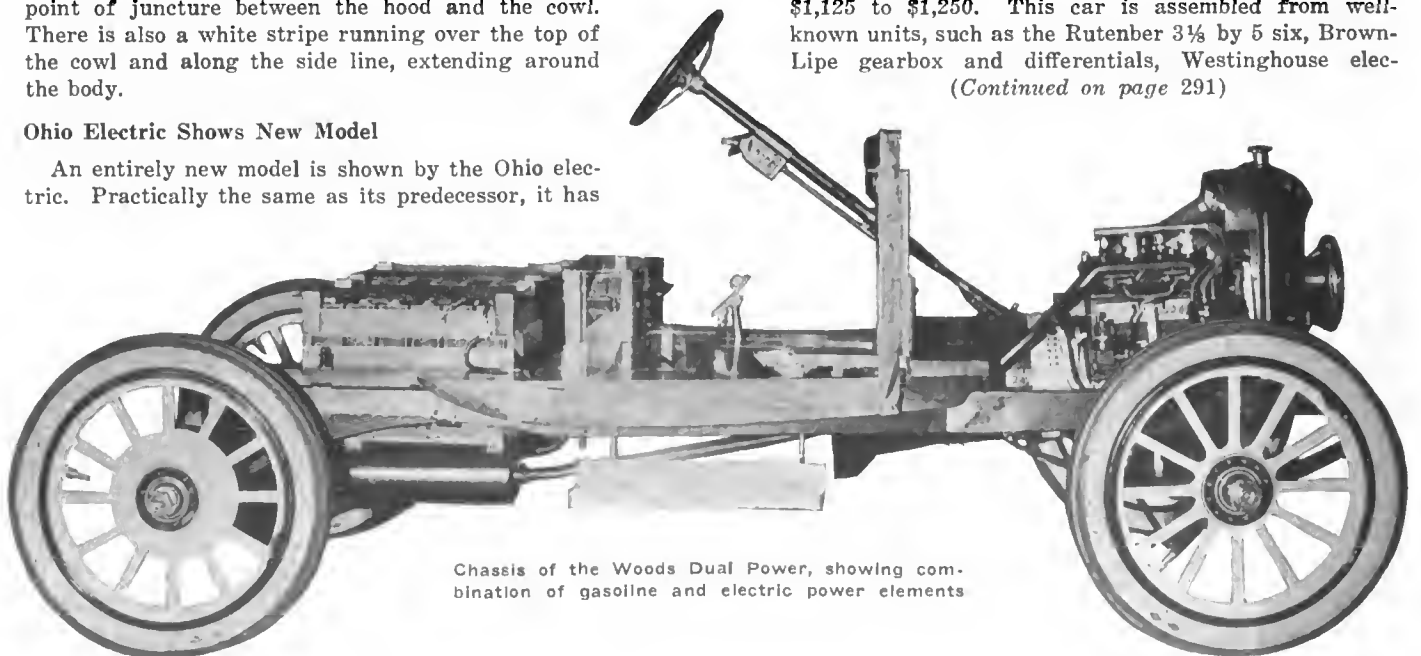
Upper left—Regal tail-light and license plate holder. Upper right—Bonnet clip on the Chicago six. Lower left—Mercor tank filler. Lower right—Stutz control lever gate lock for neutral position

been reduced in price from \$2,900 to \$2,380, due to its greater standardization in manufacture. The cut in price has been possible largely because of reduction in the number of options allowed to purchaser. In the previous model it was customary to allow an extremely wide range in upholstery and color. Only three colors are now given as optional and four styles of upholstery. The colors are Ohio grey, Ohio blue and Roadster green. There also have been some detail alterations in the structural work of the body and fenders which improve these parts proportionally.

**Glide Raises Price**

The Glide car, made by the Bartholomew Co., Peoria, Ill., was not exhibited at the New York show but is at Chicago. Mechanically the car has been illustrated and described in these pages; the price, however, has been raised from \$1,125 to \$1,250. This car is assembled from well-known units, such as the Rutenber 3 1/2 by 5 six, Brown-Lipe gearbox and differentials, Westinghouse elec-

(Continued on page 291)



Chassis of the Woods Dual Power, showing combination of gasoline and electric power elements



General view of Chicago's second annual salon held in the Elizabethan room of the Congress Hotel

## Custom Bodies at Chicago Salon

Exclusiveness Characterizes Exhibit Which Includes Six Makers Besides Four Showing Last Year—Disbrow a Feature

CHICAGO, Jan. 29—Chicago's second annual automobile salon, which opened to-day with a dozen exhibitors in the Elizabethan room of the Congress Hotel, gives evidence of the well-established demand for exclusiveness. This feeling, which prompted some of the largest dealers to put out the stock chassis with high class, custom made bodies, is the fundamental reason back of the salon. New York has had its salon for a dozen years, but only recently has exclusive body trade achieved prominence in other cities.

A year ago the first effort was made to meet this situation with an exhibition in which exclusiveness would be the keynote. Four manufacturers sensed the psychology of the move and got together in the first Chicago salon. These four were White, Simplex, Brewster and Lancia. This year there are all of the first four and in addition Locomobile, Daniels, Fageol, Doble, Murray and Disbrow.

Prices vary in accordance with the degree of artistic handiwork and expensive material, the Fageol, at \$9,500 for the chassis and \$12,000 with the elaborate touring body, representing the maximum. The cars, however, which represent the spirit of the salon better than anything else are those on well-known chassis but fitted with bodies that represent the individual art of the custom body builder.

People come to buy these cars and the actual proportion of prospects to visitors is far in excess of the National Shows. Price is the last consideration with those who buy at the salon. The purchaser of the custom-made shoe bears the same relationship to the buyer of the stock product as the purchaser of a salon car bears to the stock car buyer. It is the desire for individuality and style.

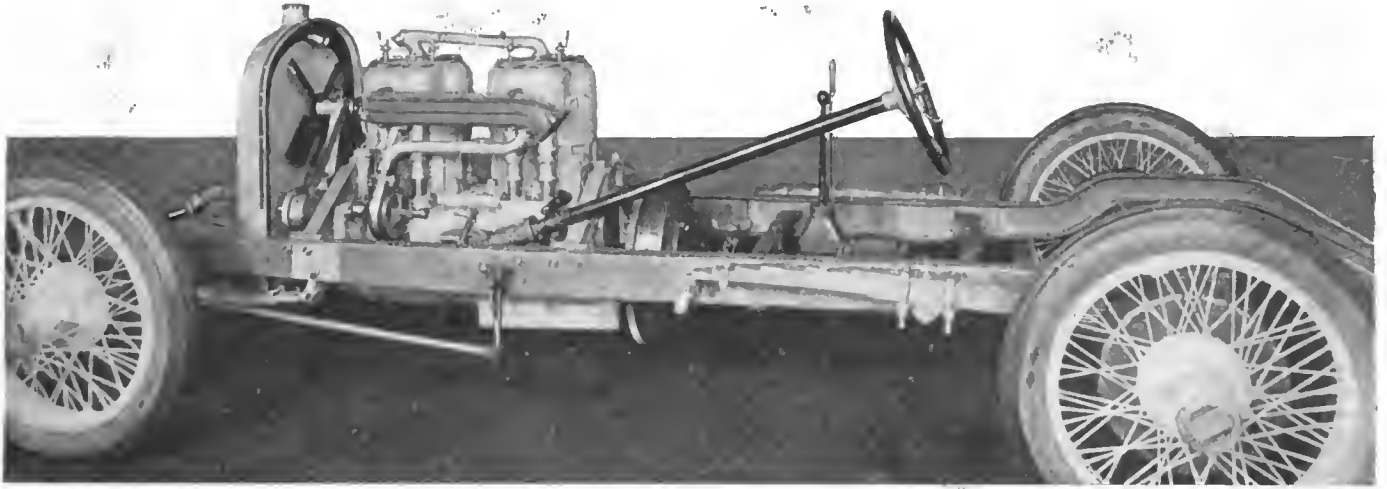
Two new cars not seen at the automobile salon in New York are at the corresponding event in Chicago. These are the Fageol car, described in THE AUTOMOBILE for Jan. 25, and a sporting and speed design by Louis Disbrow. In addition, C. P. Kimball is showing some bodies that were not seen in New York, including a striking touring car with a number of new and ingenious features mounted on the new Fageol chassis and a landau with some interesting characteristics mounted on the Doble steam chassis.

Many of the cars seen in the New York salon have been moved to Chicago directly, while other companies are showing similar cars but finished in different colors. The White company is showing the same line of bodies, including two limousines, a cloverleaf and a touring car, all by Rubay. This is quite similar to the line shown in the East, but the colors are somewhat different.

Altogether, the salon is a very domesticated exhibition. There is a Lancia there to give a foreign touch, but this is obviously a chassis that has not lately arrived in the country, although it represents the latest practice of the factory.

The new Disbrow car, which is the real new thing at the salon, is a product of the shop of Louis Disbrow, former driver of racing cars. It is entirely a speed design and is shown in a special aluminum body made by Disbrow in his Cleveland plant. There is very little to the body besides the hood over the motor and a pair of racing style seats. The bodies are made up individually to suit the size of the purchaser. A unique point is the employment of bicycle-style fenders which turn with the front wheels, so that,





Chassis of the Disbrow speed car. Wheelbase is 114 in. on both models, the only difference in the two being that the engine of one of 5 1/10 by 5 1/2 and the other 5 1/4 by 7 in.

although they are small, the driver is protected from the mud spray while turning a corner. The power plant is a Wisconsin product designed to Disbrow's specifications. The car is furnished in two models which are interchangeable in all respects and only differ in the engines. Both of these are T-heads, with the cylinders cast in blocks of two. The smaller engine of the two employed is 5 1/10 by 5 1/2 and the larger 5 1/4 by 7. Both of them have steel pistons with exceptionally light alloy steel rods. The crankshaft is a racing style made rigid and carried on three large main bearings, with pressure oil feed. Although the difference in bore of the two engines is 0.15 in., the valves are the same size and are interchangeable. They are 2 3/8 in. in diameter and are made from tungsten. The valve drive is conventional, being through helical gears, with the cam layout somewhat similar to that used on racing cars. The cams approach the constant-acceleration type with a long dwell and a quick lift. The clutch is a Borg & Beck multiple disk and the gearbox a three-speed Warner. Standard final drive ratio is made to suit the purchaser.

#### Car Practically Hand-Built

American ball bearing floating axles are used. These are special axles cut directly from the billet for the car. In fact, the entire machine is practically hand built and fitted throughout, and, although an assembled car in the final analysis, the parts are in most instances special and designed to meet the high-stresses of fast driving. The frame is a product of the Hydraulic Pressed Steel Co. and the wheelbase is 114 in. on both the large and small models. Both sizes carry 33 by 4 1/2-in. tires, and the prices are \$3,500 for the larger car and \$2,650 for the smaller.

The electrical equipment, including lighting, starting and ignition, is Bosch. Double ignition is used with two sets of plugs mounted on each side of the T-head engine. The carbureter is a Miller racing type. A speed of 80 m.p.h. is claimed for the smaller and 90 for the larger model.

As always, the salon is the place for an exceptional line of body exhibits. Locomobile is showing a four-pas-

senger roadster in cream with fine black striping. A green limousine and a cream-colored landaulet are also shown by the same concern.

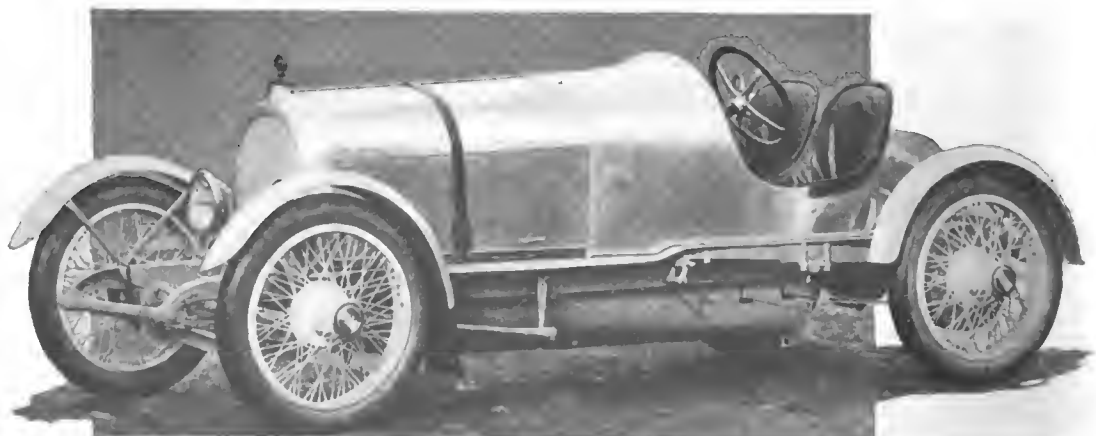
Simplex is exhibiting a cut-away polished chassis, as well as an attractive six-passenger touring and a black limousine. The six-passenger body does not carry the extra seats concealed but folded directly against the backs of the front seats.

Brewster is exhibiting a red two-passenger roadster with red cloth upholstery. There is also a four-passenger roadster in Brewster green which has a neat little feature in the way of plunger door locks allowing the door to open when they are pressed. Green leather upholstery is used on the driver's seat of a Marmon landaulet made up by the C. P. Kimball company. The interior is finished in green plush.

#### Fageol Priced at \$12,000

Probably the most expensive car on the floor is the Fageol with the Kimball gray green touring body. As it stands it is listed at \$12,000. It has adjustable front seats which slide back and forth to suit the occupants. It is fitted with a Victoria top lined with silk plush. The outside of the top is mohair. The floor coverings are also of silk plush over the mahogany floorboards. The ventilators in the top of the hood are striking and also tend to relieve the long line of the hood covering the Hall-Scott aviation engine housed within. The sale price of the engine alone is \$5,400.

The Murray and the Daniels cars that were shown at New York are at the salon. The former exhibits a green seven-passenger touring car and the latter a touring design painted white with mahogany trim.



Disbrow sport car, built by Louis Disbrow, former racing driver. It has a special aluminum body and bicycle-type fenders

# 17 New Accessories at Chicago Show

Although Not as Numerous as the New Things at New York, as Great a Variety Is Evident in the Display

**E**LSEWHERE in this issue it is pointed out that the facilities for the display of accessories are not nearly as favorable at the Chicago show as at New York. However, in spite of the fact that these circumstances necessitate the scattering of these devices into such spaces as are unavailable for car exhibits, seventeen entirely new devices were brought out at this show by fifteen manufacturers. These accessories are briefly described and, where illustrations were available, illustrated in the following pages. There are no two things alike, an unusual feature when the large number of exhibitors is considered.

## Warner Wheeltilt

This device converts the Ford steering wheel into a tilting type. It is a snap hinge, one side of which is bolted to the end of the steering column and the other attached to the steering-wheel hub in the same manner that the wheel was originally attached to the steering column. The wheel is held in the steering position by a latch that may be snapped out, allowing the wheel to assume the tilting position. Price, \$5.—Warner Gear Co., Muncie, Ind.

## Solar Duplex Headlight

There are two lights in one in this headlight. The upper one is for country driving, and resembles the standard headlight; the lower is similar to a side light and used for city driving. The large light has a reflector over it of 9½ in., and is fitted with clear glass and an 18-c.-p. bulb. The small reflector is 3½ in. in diameter, fitted with a dimming lens and a 12-c.-p. nitrogen bulb. These lamps can be made for practically any electrical system or to fit on any car. Finished in brass, in black, or in nickel and black.

Price per pair, \$20.—Badger Brass Mfg. Co., Kenosha, Wis.

## Motor Eye

Temperature of the cooling water is given by this instrument. It comprises a thermometer which enters the water within the radiator and registers on a disk mounted on the filler cap. Made in a variety of types, for use on different makes of car, in the standard type with round dial, it sells for \$5.—Metalware Corp., Chicago.

## Shakespeare Carbureter Fittings

Fittings for all carbureters, consisting of a lever for operating the primer and temperature control mounted either on the dash or steering column and a warm-air stove for attachment to the exhaust pipe of the engine, are now available. A sufficient flexible hose is also supplied for connecting the stove with the carbureter. Price of steering-column control, \$2; of

cowl-dash control, \$1.50, and of the stove, 50 cents.—Shakespeare Carbureter Co., Kalamazoo, Mich.

## Stewart Warner Speedometer Drive

This speedometer drive employs a spiral gear completely inclosed and mounted at the rear of the gearbox. It may be mounted on any standard gearbox and requires no mechanical changes in construction. Due to the inclosed feature the gears run in oil and all dust is excluded. Two new speedometers with extra large odometer figures are also offered. A feature that is incorporated is a novel odometer resetting device, operating the same as the reset device in a stem-winding watch. A knurled knob mounted at the right of the speedometer case is pulled out and the odometer figures reset in an instant.—Stewart Warner Speedometer Corp., Chicago.

## West Cast Steel Wheel

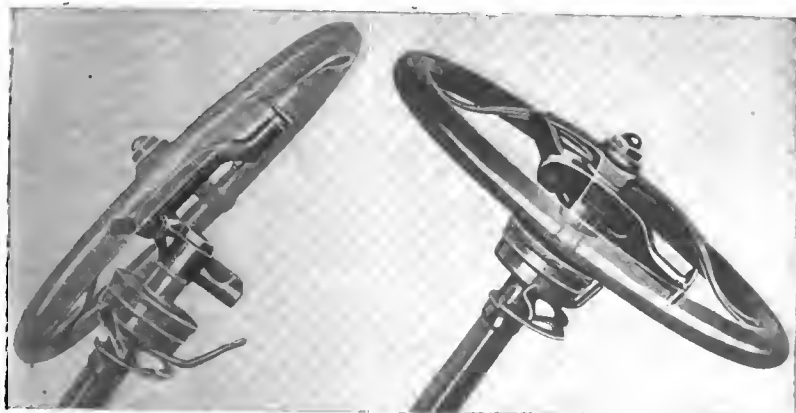
These cast steel truck wheels, made in one piece, are designed to replace wooden wheels. These wheels are said to be lighter than wood and to possess none of the disadvantages of the wood construction. They are not affected by climatic changes and are guaranteed for the life of the car. Either pressed on or demountable tires may be used. The price is \$30 to \$40 for set of four.—West Steel Casting Co., Cleveland, Ohio.

## Protector Spark Plug

This spark plug has the porcelain completely housed in the metal bushing and covered at the top by a horn-fiber cap. This cap carries the secondary terminal and leaves a gap between the terminal,



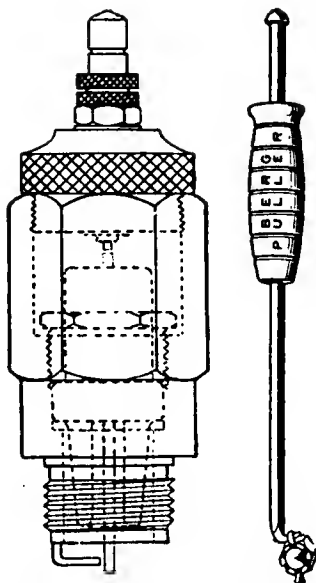
Motor Eye radiator thermometer



Left — Warner Wheeltilt for Fords is a special hinge

Right — West cast steel wheel





Left—Protector spark plug  
Right—Burg cotter-pin puller

stud and the electrode, acting as an intensifier to produce a hotter spark. The firing points are nickel-alloy steel made in one piece without welding. Price, \$1.50.—Wales-Adamson Co., 1402 South Michigan Avenue, Chicago.

#### Lipman Air Service Station

This station in form resembles a curved gasoline pump and comprises a cast iron base holding an electric motor and a four-cylinder air compressor, directly connected to 28 ft. of hose contained in a compartment just above the base. The hose is reached by means of a hinged door, and when the pump is automatically started closing the door stops the pump. A 14-in. opaque electric light globe is mounted at the top of the column, standing about 9 ft. above the street and bearing the words Free Air. Price, \$105.—Lipman Air Appliance Co., Beloit, Wis.

#### Vesta Searchlight

A mirror, a Cutler-Hammer switch located in the handle and a bracket designed for the car to which it is to be attached are features of this searchlight. The body of the lamp is heavy steel and may be enameled in any color to match the finish of the car. The mirror is 3/8 conflex condensing type and is placed so that it can be quickly focused to obtain a rear view. The reflectors are brass heavily silver plated and all lamps are equipped with Mazda nitrogen-filled bulbs. The price of 7¼-in. light, finished in black, is \$8; finished in nickel with brass doors, \$8.50; finished in any color, \$2 extra.—Vesta Accumulator Co., 2100 Indiana Avenue, Chicago.

#### Easy-on Tire Chains

Traction is obtained by using individual cross-chains secured to the spokes. The device consists of a gripping mem-

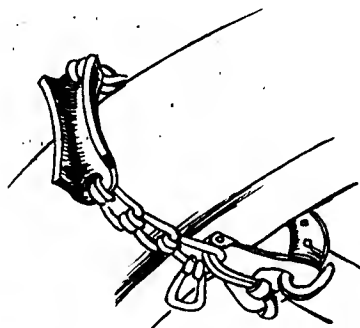
ber that is a half-hourglass section and held to the tread of the tire by chains attached to a catch snapped on a spoke. This gripping member is so formed that it does not tend to cut the tire, and the fasteners on the spoke are leather-covered to prevent injury to the paint. Another feature of these chains is the method of attachment to the spoke, this being done by a snap catch that may be fastened or removed in an instant. Four chains are used for each rear wheel and the sets are made in three sizes. The prices per set are: 3 to 3½ in., \$3; 4 to 4½ in., \$4; 5 to 5½ in., \$5.—Woodworth Mfg. Co., Niagara Falls, N. Y.

#### Burg Cotter-pin Puller

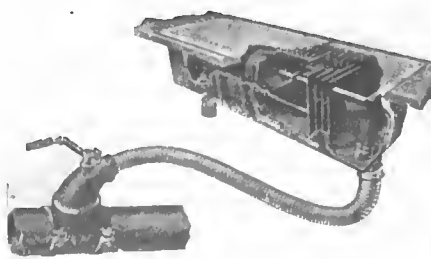
The handle on this cotter-pin puller slides along the shank in a manner that permits removal of the pin by impact after hooking into the eye of the cotter-pin. The tool consists of a short steel rod about ¼ in. in diameter having a small hook at one end, carrying a sliding handle and headed at the opposite end. It is made in two styles: black finish, \$1; nickel-plated, \$1.25.—Wales-Adamson Co., 1402 South Michigan Avenue, Chicago.

#### G. L. W. Spring Oiler

The G. L. W. spring oiler consists of a felt pad, metal-covered, which lies flat on the top leaf of the spring. The felt is hollowed out in the center and carries a quantity of oil, which gradually works its way down over the sides of the spring leaves and thus in between the leaves, giving a constant inner-leaf lubrication. The pad is attached simply by snapping it in place. The advantages of spring lubrication in preventing spring break-



Easy-on tire chains, showing mounting



Vesuvian exhaust-type heater



Above—Vesta searchlight  
Lower—Steel brake shoe for Fords  
Right—Lipman air service station

age and spring squeak, and also in improving the riding quality and tire life of the car, are well known. The device sells for 20 cents.—Hudson Sales Co., 7 East Jackson Boulevard, Chicago.

#### Vesuvian Heater

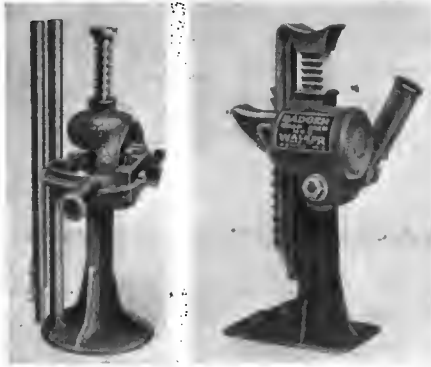
This exhaust-type heater comprises a heating chamber mounted in the floor, this chamber being made of thin steel having on the interior several steel veins to deflect the gases so that they radiate heat to the exterior. The outside of this chamber carries many steel radiating fins, and the entire heating element is mounted in a pressed-steel case beneath the radiator, which is set flush with the floorboards. Price, \$15.—Reliable Auto Heater Co., Cleveland, Ohio.

#### Steel Brake Shoe for Fords

This brake shoe for Fords is steel throughout, and is claimed to be indestructible. The feature of the steel construction, in addition to the increased strength, resiliency and ease of relining, is lightness. These shoes are packed in cartons containing one complete set, including springs. Price, per set, \$2.—Humboldt Machine & Stamping Co., Long Island City, N. Y.

#### Heco Vacuum Feed

Suction from the intake manifold operates this gasoline feed system. The system is embodied in a small tank located beneath the hood on the fuel line between the main gasoline tank and the carbureter. Suction draws the gasoline from



New types of Badger jacks. Screw type is at left and gear type at right

the main tank into the vacuum tank, and it is fed from there by gravity to the carbureter. The tank proper has an upper and lower chamber, the upper containing a control mechanism and the lower acting as the gravity feed tank. These two chambers are separated by a metal partition carrying the valve mechanism and the single valve. This valve controls the flow of gasoline from the upper to the lower chamber, and is actuated by a float. It may be installed on any car. Price, \$8.—Heinze Electric Co., Lowell, Mass.

#### New Badger Jacks

Two new styles of Badger jacks are a screw type and a gear jack. The screw jack is of the conventional type, driven by two pawl-operated bevel gears, the feature being a thumb nut that allows speedy adjustment and a long jointed handle permitting the jack to be readily operated. Price, \$4.50. The gear jack is combination worm and gear driven, giving extreme leverage with small pressure. Rapid action of the jack up and

down is secured by revolving the handle. The worm is said to lock the jack, making it impossible for the jack to drop under load. A two-piece, 20-in. handle is included. Price, \$8.50.—Walker Mfg. Co., Racine, Wis.

#### Dixon's Non-leak for Fords

This graphite grease is compounded for the Ford differential and is said to prevent any leakage going into the axle. It is packed in 2½-lb. cans, each containing just enough for one Ford differential. Price, 85 cents per can.—Joseph Dixon Crucible Co., Jersey City, N. J.

#### Jackson Electric Valve Grinder

This portable motor-driven tool for grinding poppet valves comprises a vertically mounted electric motor driving the valve-grinding head with a "back-and-forth" movement by means of a gear, connecting-rod and offset crank. Tools are made in two sizes, No. 1 for grinding valves up to 2¼ in. in diameter, driven by a 1/10-hp. motor and particularly adapted to service-station work. No. 2 is for continuous heavy-duty manufacturing purposes, and will grind valves up to 4 in. in diameter and is driven by a ½-hp. motor.—Wales-Adams Co., 1402 South Michigan Avenue, Chicago.

#### White's Oil Distributer

Excess oil dripping downward into the crankcase of the Ford is caught and distributed to the rear crank pockets and reservoir by this device, which keeps it at the same level in each pocket. It consists of a series of troughs made of steel combined to form a single unit and placed inside the crankcase on the right



Jackson electric valve grinder, furnished with either 1/10 hp. or 1/8 hp. motor

side. It is said that accumulation of oil under the cranks is prevented and the motor properly lubricated whether ascending or descending a grade. To install, the crankcase hand hole cover is removed, the distributor slipped in place and the cover replaced. Price, \$3.—Evapco Mfg. Co., Detroit, Mich.

#### No-Stitch Curtain Cement

This cement permits of a quick and easy repair of celluloid lights in top and side curtains without removing the curtain from the top. The manufacturer claims that it makes a water-tight union which is not affected by heat or cold. It is put up in 1 oz. cans, sufficient for repairing a number of lights, retailing at 25 cents, and in 1 pt. cans for large consumers at \$2.—Auto Products Mfg. Co., 40 Elm Street, Buffalo, N. Y.

## Four New Cars Appear at Chicago Show

(Continued from page 286)

trical equipment, Stewart-Warner vacuum system, etc. The body is roomy, having a 47-in. rear seat and a 42-in. front. It is finished in meteor blue with black running gear. Wheelbase is 119 in. and the car is provided with 34 by 4 tires. A detachable sedan top is provided for \$200.

#### Monitor Has Standardized Chassis

Two chassis not previously seen are exhibited by the Monitor company. These are a four and a six, and many of the parts of the two are interchangeable. The motors are a six-cylinder Continental 7 W 3¼ by 4½ for the six, and a four-cylinder Golden Belknap & Swartz for the four. The electrical equipment is made by the Heinze company. The carbureter for the six is a Stromberg and the four a Schebler, and the chassis parts are made by other well-known parts makers. The wheelbases are 110 and 117 in. respectively for the four and six, and the prices are \$895 and \$1,095.

#### Some Concerns Exhibit Outside

Some of the companies which were not able to obtain space at the show are exhibiting outside. Across the street

from the Coliseum the Comet Automobile Co. has its touring car on exhibition. This concern has its home in Decatur, Ill., and is showing a car with a six-cylinder 3½ by 5 block motor equipped with Delco ignition, Dyneto starting and lighting and a Zenith carbureter. The clutch is a Borg & Beck and the axle is floating. The springs are cantilever, 50 in. long. This car sells for \$1,185 and is equipped with a double-cowl body.

At the New Southern Hotel is the Colonial, made by the Colonial Automobile Co. of Indianapolis. This is an assembled six with an overhead valve engine operated by exterior pushrods and rocker arms. Over the head of the engine there is a detachable cover plate and the priming cups are in the side of the cylinders. The wheelbase is 116 in. and the chassis construction is simple, with a drop frame used in connection with cantilever spring mounting. The clutch is an inverted cone and the gearbox has three speeds and New Departure bearings. The axles are the product of the Lewis Spring & Axle Co., with the drive pinion on New Departure bearings and the differentials carried on Gurney bearings. The car is listed at \$995, including complete equipment, tool kit, etc.

# Cannot Define Gasoline

## Gravity Useless for Determining Quality— National Gasoline Committee To Be Formed

By A. Ludlow Clayden

**T**HAT there is a great deal of fraud in the gasoline business, that gasoline cannot now be specified without the risk of raising its price, that engines of the future must be made to burn fuel of a lower volatility and that the fuel situation needs the concentrated study of both the automobile and the oil industry were the main conclusions reached at the most important meeting ever held to discuss gasoline. This meeting took place at the Bureau of Standards in Washington Jan. 25 and 26, and was a "hearing" called by a joint committee of the Bureaus of Mines and Standards.

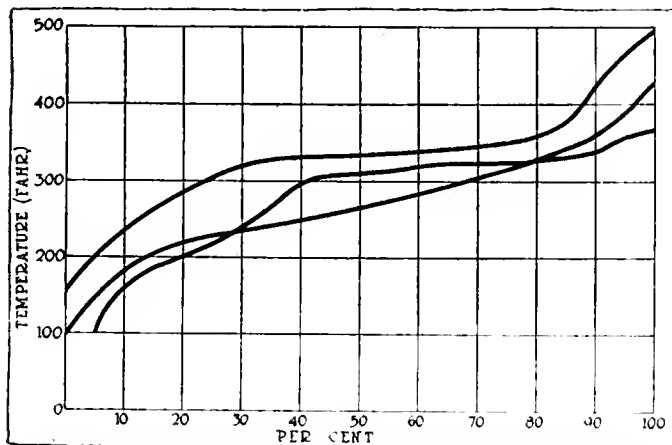
There were present members of nearly all the large oil firms, representatives of the oil men's associations, individual members of small oil firms, representatives of State and city legislatures from all over the country and representatives of the S. A. E. For two 6-hr. sessions they discussed and argued every phase of the situation, and the amount of real information gathered was enormous.

The wonderful thing about the meeting was the spirit of co-operation. There were no sides to the question, one did not find the oil men in one group, the legislative people in another and the engineers in a third. Each was ready to appreciate the difficulties of the other. In brief, the situation appears to be as follows:

*There is plenty of gasoline to care for future years, but to keep the price down it will be essential year by year to lower the volatility. This the engineers are prepared for and they think they will be able to take care of the situation. The engineering attitude is that almost any kind of fuel can be provided for; the essential thing is to know what is coming.*

### Retail Fraud a Trouble

The greatest abuse at present is fraudulent action by retailers, and the discussions made abundantly clear the fact that it will not be easy to frame a law which will prevent fraud. It would seem easy to specify gasoline in some way so that the mixing of anything else with it could be detected,



Distillation curves for different gasolines giving about the same service can vary as much as or more than these shown and nobody can say whether one is really better than another

but this is apparently not possible because of the extremely complex nature of the liquid.

To appreciate the purpose of the meeting, how it arose should be explained. The District of Columbia wished to control gasoline and applied to the Bureau of Mines and the Bureau of Standards to tell them how to do it. These two bodies appointed a joint committee which corresponded with the industry and collected a considerable amount of information. They then called the meeting and placed before it three possible schemes. It must be understood that neither of these schemes is fathered by the bureaus. They were suggestions derived from the correspondence examined, and the method of conducting the meeting was to ask each speaker to discuss the three possible schemes and then make any suggestions of a different nature that might occur to him.

### Possible Schemes Submitted

**A**—Recommend that nothing be done along the lines of national, state, municipal legislation relating to petroleum motor fuels.

If you favor A, the possible effectiveness of such a recommendation should be considered, that is, whether in the present state of public opinion such a recommendation would not, as a matter of fact, result in independent state and municipal legislation. It has been represented to the committee that legislation is inevitable, and that if the national government does nothing such legislation must be discordant.

**B**—Adopt standard specifications for "gasolines" and require that all motor fuels sold in interstate commerce under the name of "gasoline" comply with and be sold under the designation of one of these established specifications.

If you favor B, how many standard specifications should be adopted, and why? Would such specifications need frequent revision? If so, how could state and municipal legislation be kept uniform under this plan?

**C**—Do not adopt any standard specifications, but simply require that all gasolines or motor fuels sold in interstate commerce be labelled as to their 20 and 90 per cent (or 95 per cent) distillation temperatures, so that the purchaser would at once know the degree of volatility of the motor fuel he was purchasing. Thus for motor fuel labelled 100-200, the numbers would mean that at least 20 per cent would distil over below 100 deg. Cent., and at least 90 per cent (or 95 per cent) below 200 deg. Cent.

This plan embodies the fundamental principles of the pure food legislation. It provides for every kind of petroleum motor fuel, simply requiring that it be "labeled" as indicated.

Should the temperature of the 85 per cent fraction, or of the 90 per cent fraction, be specified? It has been pointed out that the distillation curves of some gasolines show a sharp upward bend beyond the 90 per cent fraction, and that by specifying the temperature of the 90 per cent fraction and including a further requirement that the dry point shall not be more than —degrees above the 90 per cent fraction, the presence of an undue amount of heavy ends would be eliminated.

Should limitations be placed upon the meaning of the term "gasoline"? For example, the distillation temperatures of petroleum products sold as gasoline have been steadily increasing. Should some limit be fixed beyond which these products should not longer be termed "gasoline"? At the present time these limits have not yet reached the 150-300 deg. "cut," which is still known as kerosene or illuminating oil. Some have recommended that the limits for gasoline be placed at a point not necessarily where satisfactory operation is possible with existing engine equipment, but at least where any gasoline engine can start without special preheating devices.

(Continued on page 301)

# Foreign Trade Department

## Legalized Co-operation in Export Sales, Formation of a Sound Shipping Policy and a Bargaining Tariff Are the Three Great Essentials for Our Foreign Trade

1250 Delegates Attend America's Export Convention—National Foreign Trade Council Stages Best Foreign Trade Convention in Our History—Automobile, Truck and Accessory Makers Poorly Represented

By David Beecroft

**P**ITTSBURGH, Jan. 27—All of the 1250 delegates attending the fourth annual convention called by the National Foreign Trade Council have had an opportunity for 3 days to hear every aspect of foreign trade discussed; have heard about competition after the war; have been told how large and small manufacturers can co-operate in foreign trade as is done in European countries; have been told about the Webb bill and how, if passed, it will permit combinations for foreign trade; and have been told of the thousand and one other problems connected with greater foreign trade.

The fact that 1250 delegates attended as compared with less than 500 at the convention a year ago recites how interested all makers are in foreign trade, for in these 1250 delegates are represented hundreds of small makers as well as the largest manufacturing combinations in the country. Besides manufacturers there has been a large representation of exporting houses, very large representation of chambers of commerce from every state and large representations of manufacturers' organizations. The Pacific Coast delegates, 150 strong, arrived in a special train; there was another special trainload from Washington and New York. Over fifty delegates arrived from Texas.

The representation of automobile and automobile accessory men was not as large as anticipated. Not over a dozen of the largest companies had their export managers present; in addition

nearly a score of accessory companies were represented by export men, the tire companies leading in this representation. Very few representatives of motor truck makers were present, excepting those concerns which are large makers of both passenger cars and trucks.

Such a convention as the present one gives a good portion of its time to the consideration of broad national problems affecting export trade, and the manufacturer expecting to go home with all pockets filled with specific information to meet his particular needs in export work will generally be disappointed. Such a convention with practically every industry in the country represented cannot resolve itself into groups for different industries, but a good part of one afternoon, a whole evening session and added sessions did consider specific export questions. This was made possible by dividing manufacturers engaged in export work into two groups; large manufacturers and small manufacturers. These groups met separately. Each considered the broad question of how to co-operate in export trade.

The work of each group largely followed the plan of submitting questions which were answered by men who have spent years abroad in export trade. With the group of large manufacturers many tangible plans for closer cooperation were outlined.

The program was not quite so definite with the much larger group of smaller manufacturers, many of whom

### Convention Deductions on Export Trade

- 1—The Webb bill must be passed by the Senate to legalize co-operation of U. S. A. manufacturers in pushing export trade.
- 2—All European countries have built up their export sales on co-operative methods which are fostered by their governments.
- 3—The new Europe at the close of the war will be a financially strong Europe—one ready to meet all loans, redeem all pledges and care for all obligations.
- 4—The world's financial center will still be in Europe after the war.
- 5—Time credits will have to be extended to all European countries after the war.
- 6—Few European countries will dump low-priced goods in our market for several years after the war ends.
- 7—Japan has driven our ships out of Pacific Ocean trade.

had not had any experience in export trade, yet all had come to the convention with the hope of going away with a completed code of procedure for building up export trade in any country in the world. Naturally such delegates went home disappointed because it was not within the province of such a convention as the present one to go into such details. But in the group meeting, which partook much of the nature of an old-fashioned Methodist experience meeting, literally dozens of concerns that have been in the export field for some years told how they sold their goods in different countries, and offered to help any delegate.

#### Information Readily Available

The management of the convention did good work in this matter of giving general information, and had appointed over forty trade advisors who were competent to give advice on foreign trade in nearly as many different countries of the world. It was possible for any delegate to meet these individual trade advisors and get information on any country.

The National Foreign Trade Council deserves congratulations on the manner in which it worked to serve the varied needs of such a wide range of delegates. Another year this phase of the convention will certainly have to receive more attention. It is questionable if in future conventions it may not be desirable to divide the convention broadly into two large classes:

Class A: The consideration of broad national and international questions affecting export trade.

Class B: The consideration of questions specific to different groups of manufacturers engaged or contemplating engaging in export trade.

There is such a broad difference in the requirements or wishes of the two divisions as to perhaps justify dividing the entire convention into two such groups, with the exception of perhaps one half-day session.

#### Scope of the Convention

Much of the present convention was given over to what might be designated addresses, papers and discussions on broad national and international questions affecting export trade. For example: A forenoon session considered various questions with regard to matters in which the entire question of a merchant marine was considered, and in which valuable information on the number of ships being built each year since the war started; the reduction in tonnage carried by American ships since the war started; the increase in tonnage carried in Japanese ships since the starting of the war; the amount of ship building being done in our own shipyards for home demands and the amount for foreign countries, and also a general review of the attitude of Congress toward our shipping interests since 1818; and a review of the handicaps placed on our shippers and an explanation of how our merchant marine has practically been driven off the high seas. Such a broad consideration of ship-

ping was highly educational, but not specially valuable to the manufacturer who came to the convention to learn how to establish an export trade or how to co-operate with other manufacturers in his field or those in related fields.

The subject of shipping is vital to our export interests, and it is unfortunate that the presidents or general managers of perhaps a hundred of our automobile companies, as many truck makers and as many accessory makers were not present to get the spirit of the convention. True, a very scant few of these had their export managers present, but while the message was good for the export manager, it was more suited to the president or general manager, who should be familiar with these broad questions because of the greater power he can yield in correcting such abuses than his export manager.

The export manager was interested in the group sessions of large and small manufacturers. That was his proper place. That was where he was expected to learn and to give information, but his president should have been present for the consideration of the broader questions.

#### A Bargaining Tariff Needed

Perhaps as important a national issue as came up was that of foreign trade aspects of the tariff, which was introduced by Willard Straight, vice-president of the American International Corp., a New York organization formed for promotion of foreign trade, particularly in Latin America. Mr. Straight, in a lucid explanation of the present tariff, told how it is impossible to raise our present tariff schedules, and how we are sorely in need of a bargaining tariff the same as other nations possess, so that the president could have in his control the power to raise tariffs as necessary to meet with foreign competition. Such powers would give quick action, which is impossible under our present arrangements. Our present tariff is barren of any trading margin.

He told how the tariff systems of the world will all have to be revised to meet conditions when the war ends, and how the British free trade policy has already been widely changed and will unquestionably remain changed for many years when the war is over.

Mr. Straight told how different groups of nations in Europe have united in the interest of their foreign trade; of how three Scandinavian nations entered into a comprehensive trade arrangement last July; of how the British Empire and the Entente Allies have already united and formulated plans for trade co-operation; of how the Central Powers have, since the beginning of the war, been united in every act with regard to foreign trade; of how after the war the countries of the Central Powers will buy as a nation and how individuals in such a country as Germany will not be permitted to go into foreign markets as individual purchasers; and he told of a score of other broad national and international questions that the presidents of our companies should have been listening to alongside of their export managers.

The convention presented an opportunity impossible in any other convention on such subjects. They are subjects that the managements of factories should be familiar with. They are subjects on which Congress and the Senate must be moved to action on, and when such movement has to take place the president and general manager rather than the export manager are the people who will have to do the political work, if it may so be designated.

#### Reconstruction in France

The question of world conditions after the war was not as prominently featured as many expected. There was in this connection one particularly good address by W. W. Nichols, who was chairman of the American Industrial Commission to France which spent 45 days last fall studying the field of destruction in France and looking into the question of what reconstruction work will have to be done in France and Belgium when the war is over. The committee has a very valuable printed report in the form of a well-illustrated booklet which was on sale at the convention and which is for general distribution.

Mr. Nichols told of the zone of war destruction, which in France alone includes 750 towns, and in addition four cities of over 100,000 population each. But great as the work of reconstruction may be in the war zone, Mr. Nichols believes that it will be exceeded by the work of reconstruction through all of France.

He told of how the Touring Club of France, an automobile organization for the distribution of touring information, in co-operation with the hotel associations and other organizations, plans to spend \$100,000,000 in the general rehabilitation of the resort hotel system; he told of plans that will call

for 17,000 farm tractors such as our tractor makers are now producing for farm work; he told of the need of 125,000 farm plows, many of which will be used with gasoline tractors; he told of the enormous demand for other farm implements, not specifically mentioning motor trucks; he told how \$75,000,000 to \$100,000,000 will be needed in new textile machinery; he estimated that \$600,000,000 will be needed for the replacement of industrial property in the war zone alone; and finally he told how his commission believed it impossible for France to begin dumping low-priced products on the American market for many years following the close of the war.

Mr. Nichols believes that France is very anxious for close trade relationships with us after the war. France understands the people of this country and her sympathies are strong for us. "But," continued Mr. Nichols, "it is more than probable that U. S. A. exporters will have to review their selling methods and that cash on bills of lading in New York will have to stop. Such methods do not conform with common business practice of other exporting nations and are the exception rather than the rule."

#### Long-Time Credits Safe

Mr. Nichols believes that after the war France will require long-time credits, but he believes that caring for these credits is rather a question to be handled by our bankers than by our manufacturers. He feels that there is no danger of financial losses connected with such long-time credits because the French national character incorporates an innate repugnance to bankruptcy. Bankruptcy is considered a disgrace in France, and so there are few dangers connected with credit extension to that country.

## The New High-Efficiency Europe

After War European Nations Will Leap into World Trade Markets with All the Aggressiveness of the Battlefield

EUROPE after the war, or the new Europe, the co-ordinated Europe, the efficiency Europe, came in for general comment at a score of different times during the convention, so the unanimous consensus of opinion is that all Europe will emerge from the war as a young athlete after his weeks of hard training for the final football game or for the annual athletic meet. It will be no weakened Europe, but a Europe filled with men hardened by months of physical training and outdoor life, a Europe breathing through every pore the lesson of co-operation.

Louis E. Pierson, chairman of the Irving National Bank of New York City, speaking on American Banking in Foreign Trade, sees Europe after the war stronger financially and better equipped for world trade than before the war. Here is how Mr. Pierson puts it:

"Europe of the future will yield no less powerful influence in the world of finance than did Europe of the past.

"We dwell too much on the idea of a war-devastated, war-scarred, helpless Europe, and we have been unable to see the other Europe, the Europe of aggressiveness and power, which after the war will face the world, a better customer and a more dangerous competitor than ever before."

Comparing the United States with the various countries of Europe, Mr. Pierson called attention to the very general co-operation between government and business in nearly every country, whereas such co-operation has been hopelessly lacking in our country. He said:

"In nearly all Europe throughout every complexion of government, all the way from socialistic Denmark, through the various republics to inten-



sively bureaucratic Prussia, there has been evolved a uniform, well-defined, nationally accepted theory, controlling all the essential relations between government and business. The importance of the result hardly can be exaggerated. Every resource seems to have been fashioned into a common national weapon, to be employed in the interest of either business or government."

Contrasting our government with European governments in this respect, Mr. Pierson continued:

"In the United States the situation is almost entirely otherwise. Business is disposed to view government as a more or less respectable policeman, and government is disposed to view business as a more or less dangerous malefactor. Each appears willing to concede to the other the possibility of merit, but neither appears willing to concede sufficiently to make it possible for both to get together upon the perfectly obvious theory that their interests are identical."

#### Europe Is Surpassing Us

To further demonstrate the extent to which we as a nation suffer because of this lack of co-operation between government and business, Mr. Pierson cited that many European nations in spite of straining every effort in the conflict are also making more preparation for post-war trade than we are. Mr. Pierson expressed this graphically and concisely as follows:

"Nationally we appear to lack ordinary comprehension. We slumber along peacefully, secure in the business of the past and in the comforts of the present, while our competitors are up and doing.

"Why even during the period of war, Europe with its losses and disturbances has already outdistanced us in progress toward preparation for the financial and commercial struggle to follow.

"England, in spite of her traditional conservatism, is preparing to build in the foreign financial

field on a scale the magnitude of which almost takes one's breath away, and in doing this is only following a theory which, for years, has been of common acceptance in foreign countries.

"Germany, in spite of enforced isolation from commercial world activities, is fostering in the foreign field every existing element of the financial power she once possessed.

"Italy, France and Switzerland are sparing no effort to extend and more fully develop their already extensive foreign financial establishments.

"Even Japan has broken away from her ancient traditions and now appears in the financial centers of the world as a power to be reckoned with.

#### We Do Not Get Together

"At the same time we in the United States, instead of reading these signs of danger, appear quite well satisfied with a fairly comfortable present foreign success which furnishes no reasonable assurance for the future."

Mr. Pierson ended with a scathing criticism of our people in which he bluntly accused us of not being able to get together, in spite of our generally proud thought of being called the United States of North America. Here is how he put it:

"Our weaknesses clearly belong to a nation whose people and institutions have not yet acquired the art of getting together; unorganization, the lack of co-ordination of effort, a powerful machine fully efficient in domestic things but not yet properly adjusted to the more highly complicated requirements of a world situation; 25,000 and more banks separate, individual, scattered broadcast throughout the country, with unlimited resources, and representing practically every interest in our nation, awaiting the light and impulse which will enable them intelligently and with united effort to meet whatever competition the world may present."

## A Strong Financial Europe

It Will Pay Its Foreign Debts, Protect Its Foreign Credits  
and Redeem Its Foreign Pledges, Purely from Self-Interest

**I**N addition to the prevailing consensus of opinion that Europe will not be crippled in a manufacturing sense after the war and that she will be very aggressive in her foreign trade, Mr. Pierson contends that financially Europe will not be weak, in spite of the enormous war costs, and in spite of the enormous sums that will be expended in reconstruction work.

It was voiced by C. H. McIntosh, vice-president of the Bank of California, San Francisco, that we should not be misled by the fact that so much gold has come to us since the war. Mr. McIntosh claims that it is not to our advantage to drain gold from other countries to our coffers; and that our interests in the soundness of financial conditions abroad are second only to our interests in the soundness of financial conditions at home.

Mr. McIntosh charged us with being too selfish in our foreign trade, and of lacking a national comprehension of the questions of foreign trade and how to solve them. We have as individual firms traveled too much on our individual roads, and have forgotten the broad road of common travel so pursued by many foreign nations. We must cultivate a broader view of foreign trade and learn to think of the whole rather than the parts. We should learn that in foreign trade our individual interests are advanced by team work, just as in a baseball or football game.

#### Europe Still Financial Center

Mr. Pierson touched on one of the biggest questions in connection with finance and foreign trade when he took up the problem of the huge loans

which we have made to belligerents. The value of these foreign loans is great. These loans are really the guaranty of credit to the belligerents to enable them to buy from us and pay for, under reasonable conditions, the products we have to sell. All European countries will meet all of these obligations. There is not a symptom of doubt as to this. The Europe of the future will wield no less powerful influence in world finance than did Europe of the past. The financial center of the world has not been moved across the Atlantic because of these loans and the war.

Mr. Pierson continued on this subject:

"The new Europe of the future, viewed as the basis of foreign loans, is entirely sound. In both disposition and ability its position as a foreign debtor may be built upon with safety. It will pay its foreign debts, protect its foreign credits, redeem its foreign pledges, and for the best reason in the world, self-interest.

#### Credits Must Not Be Impaired

"Its credits must not be impaired. Countries like France and England, whose financial power has been built upon a world commerce, and which even during the stress of war are able to maintain the most profitable world trade in their history, will not find it necessary or desirable to face the world after the war upon any other than a sound financial basis.

"With such a background as this is it probable that the new Europe will allow us to adjust the world finances of the future to suit our purely domestic whims and without proper reference to the rest of the world?

"We speak of controlling the finances and com-

merce of the world. What manner of assurances have we on this point?

"Our \$2,750,000 of gold reserve insures for us no such position, unless each dollar of it makes to the world its own particular commercial argument in the form of an offer of credit upon which a mutually profitable business may be based.

"Europe and the world buy from us now because they must, and pay us in gold because they must.

#### Present Advantages Easily Lost

"After the war they will continue to buy from us in such quantities and for such time as may be in harmony with their own interest and convenience. The controlling interest will be self-interest.

"If we are to become the great creditor nation of the world, as we occasionally assert, we must in our attitude to the rest of the world express the quality of broadness and of liberality. The European war has conferred on us no advantage which we cannot easily lose; only our best efforts will enable us to retain even our present position."

The views of Messrs. Pierson, McIntosh and others on the huge loans of European belligerents were shared by Festus J. Wade, president of the Mercantile Trust Co., St. Louis, Mo., who in drawing comparisons between the present war and our civil war showed that we in the civil war, lasting 4 years, the cost to us was 18 per cent of our entire wealth, whereas in Europe to-day the war has not cost some of the belligerents in foreign loans three-quarters of 1 per cent of their present wealth.

"To develop foreign trade we must develop credit and we must not fear that the nations may not meet their obligations. It cannot be possible that they will fail to meet these loans."

## New U. S. A. Standard Military Ambulance Design



Above is one of the new U. S. army standard ambulances, this particular vehicle being one of fifty-two recently built by the White Co., Cleveland, for service on the Mexican border. These machines have been organized into four companies, each composed of twelve motor ambulances and one  $\frac{3}{4}$ -ton repair truck. The plan of organization and the new body designs were worked out by a board consisting of Major Robert E. Noble, Major A. W. Williams, Major P. L. Jones and Captain A. C. Christie. The design has a capacity for eight patients seated inside and an orderly riding on front with the driver. Four patients can be carried on stretchers or litters. The two litters composing the upper tier are suspended by iron hooks with spiral spring attachments. The seats are leafed and hinged in such a manner that when they are not occupied by sitting patients the upholstered side is turned down, forming a floor on which standard U. S. Army litters may be carried. Under these deck-seats are compartments for ten 1-gal. tins of reserve gasoline and other supplies. Beneath the front seat on each side are compartments for carrying water tanks. Between the stanchions at the right of the driver's seat is a compartment for carrying emergency medicines and dressings.

# 61.5% Power Loss Through Tires

Internal Friction Consumes 31.2% in Front Tires and 30.3% in Rear, Professor Lockwood Tells Pennsylvania S.A.E.—Rolling Resistance Constant at 10 to 40 M.P.H.

PHILADELPHIA, Jan. 26—Tires consume 61.5 per cent of the power lost between the engine and the road wheels by internal friction, Prof. E. M. Lockwood, of the Sheffield Scientific School of Yale University told the Pennsylvania section of the Society of Automotive Engineers here last night. He also stated that the rolling resistance of a car remains practically constant at all speeds between 10 and 40 m.p.h. and that under-inflation of tires may increase the amount of power required to drive the car 25 per cent. Naturally, the latter condition would be accompanied by an approximately proportional increase in fuel consumption.

The paper was entitled "Power Losses in Pneumatic Tires," but Professor Lockwood prefaced his remarks with the statement that his investigations were not originally instituted to determine these losses. The figures and facts in the paper were incidental to a series of tests undertaken to determine the rolling resistance of a car.

The tests upon which Professor Lockwood bases his conclusions were made in the laboratory on special apparatus consisting of rollers set in motion by a calibrated electric motor. The car was anchored with the front wheels and the rear wheels alternately resting on the rollers. Professor Lockwood points out that the experiments have the limitation of being made on but one size of tire and adds that no claim is made that the entire question of tire resistance has been solved.

In summarizing the paper Professor Lockwood suggested that the present requirement is a tire which may be flexed indefinitely like a steel spring without generating internal friction and consequently heat. With such a tire, practically all rolling resistance would be eliminated. Regarding rolling resistance the paper runs:

As an example of the amount of variation of resistance with speed, the following tests are reported with readings exactly as recorded:

Rolling Resistance at Various Speeds

	Inflation in Lb. Pressure	Miles per Hour			Average
		20	30	40	
32 x 4 cord.....	60	11.7	11.7	13.8	12.4
32 x 4 fabric....	55	24.1	23.3	24.4	24.3
35 x 5* cord....	60	33.0	33.6	33.8	33.6

\*Fitted to heavier car.

These cars differed considerably in rolling resistance, but in every case the speed of the car had little or no effect on the result. Rear wheels tests were made confirming the results obtained with the front wheels, hence the conclusion from these tests that the internal rolling resistance of an automobile is practically constant at all speeds up to 40 m.p.h.

The measurements described give as a result, the total rolling resistance of the front tire and bearings, or of the rear tires and all transmissions losses. By an independent measurement a separation can be made of the tire loss from the bearing and transmission loss. This is accomplished by jacking up the wheel until the contact between the

surface of the tire is just sufficient to revolve the wheel. In this way tire resistance is practically eliminated, leaving only resistance due to bearings and transmission.

The internal power losses of the six-cylinder Chalmers chassis have been determined in this way. The tires are 32 by 4, load on front wheels, 1145 lb.; load on rear, 1545 lb.; tire inflation 75 lb.

POWER LOSSES IN 2700-LB. CHASSIS

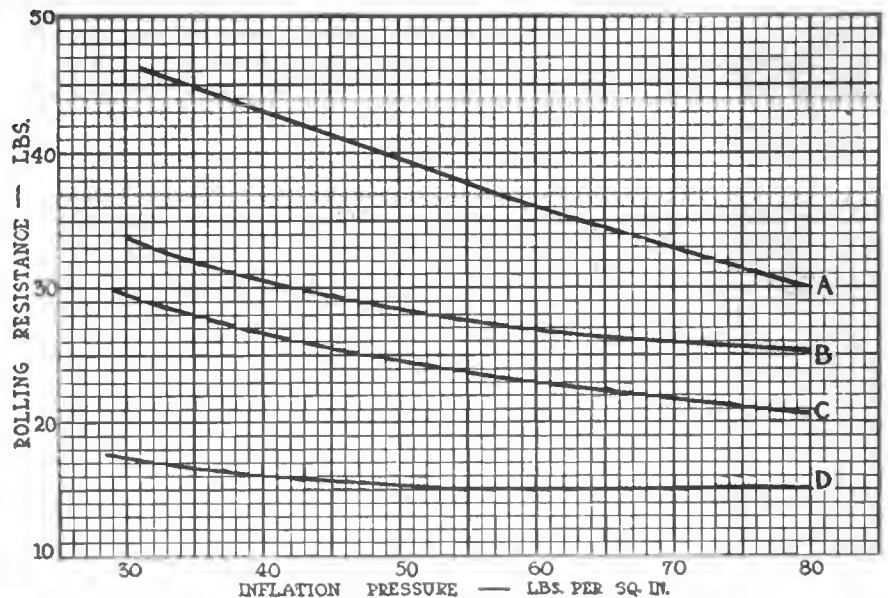
	Pounds	Per Cent.
Front tires .....	18.2	31.2
Rear tires .....	17.7	30.3
Front bearings .....	4.7	8.0
*Rear bearings .....	17.9	30.5
	58.5	100.0

\*Includes transmission.

Dividing the above four items into groups, we find that the tires alone cause 61.5 per cent of the total resistance, while the axle bearings and transmission up to neutral consume only 38.5 per cent. The conclusion is that the tires are responsible for nearly two-thirds of the power lost in the car itself. The above values are averages for speeds from 20 to 40 m.p.h. and as before stated the resistance changed little with the speed.

The discovery that 61.5 per cent of the internal power loss of this car is expended in the tires leads naturally to what becomes of this power. It is probable that friction of the material within the tire structure is continually taking place, due to flexure at the contact with the road. This absorption of work and production of heat is similar to the friction brake, except that the friction is produced by bending the fabric, not by sliding it.

Assuming the truth of these assumptions, it ought to be possible to calculate from the work absorbed the amount of heat generated, also the temperature of the tire surface when it reaches thermal equilibrium. These tires have 5.83 sq. ft.



Rolling Resistance—A—rear wheels; fabric tire load on each wheel 772 lb. B—Rear wheels; fabric tire load on each wheel 550 lb. C—Front wheels; fabric tire load on each wheel 570 lb. D—Front wheels; cord tire load on each wheel 570 lb.

of surface, and the force of resistance at the circumference is 8.85 lb. At a speed of 30 m.p.h. there will be generated 1810 B. t. u. per hour, and to dissipate this heat to the air will require a rise of temperature of 30 deg. Fahr. above room temperature, based on a heat transfer coefficient of 8 B. t. u. deg. per hour. This calculation was made in advance of any experiments, but was later verified by running one of the 32 by 4 tires for half an hour at 30 m.p.h., after which the car was stopped and the surface temperature taken with a mercurial thermometer. The room temperature was 70 deg. Fahr. and the tire temperature was 107.5 deg. or a rise of 37.5 deg. as compared with the calculated rise of 39 deg. Fahr.

This experiment confirms the theory that tire resistance is caused by flexure of the material, and leads logically to the conclusion that resistance will be increased by under-inflation and by over-loading.

Of the factors affecting rolling resistance, inflation pressure is perhaps the most important. Very considerable changes of resistance may be caused by moderate changes of pressure. The load carried by the tire is also an important factor, which must be considered along with the inflation. It seems probable that for a given load there is a region of inflation below which the resistance increases very fast.

A. K. Brumbaugh, assistant engineer of the Autocar Co., in opening the discussion inquired whether any attempt had been made to ascertain the coefficient of friction between the drums and the tires with the drums rotating, his object being

to determine whether slippage between drums and tires might cause friction which would result in heat.

Professor Lockwood stated that no attempt had been made to investigate this but that it was his impression that there was no slip between tires and drums. He added, however, that there was apparently a material difference in the composition of different tires tested, as with some tires considerable quantities of rubber were ground off and remained on the drums or on the floor in the form of scraps and dust. No tests on solid rubber tires had been attempted.

Professor Lockwood offered as his opinion that the heat generated was due entirely to the flexure of the tires and stated that the same rise of temperature resulted when either front or rear tires were tested.

B. D. Gray, vice-president of the Hess-Bright Mfg. Co., stated that in his opinion the loss attributed to the front wheel bearings was excessive and Professor Lockwood replied that the figures given in the appended table might not be as accurate as could be desired because they were made by a number of groups of men and not by an individual.

The meeting was attended by fourteen members. The next meeting is to be held Feb. 21 and the speaker will be Joseph A. Steinmetz, of Janney, Steinmetz & Co., who will give a lecture illustrated by lantern slides on the use of internal combustion engines in the European war. The slides will illustrate gasoline engines in use in submarines, aeroplanes, Russian war sleds, British tanks and the London aircraft defense.

## Aeronautic Exhibition Full of Interest to Engineers

THE Pan-American aeronautic exhibition, which opens at Grand Central Palace in New York, Feb. 28, will be far the most interesting from an engineering viewpoint of all the exhibitions of aircraft that have ever been held. This is because in the Grand Central Palace we shall see many engines and other things evolved since the commencement of the war, things which are far in advance of anything appearing in European aviation shows 3 years ago. Examples of almost every type and every size of engine are expected, many of these being of European origin, although made in this country, as for example, the Hispano-Suiza motor, which will be shown by the Simplex Automobile Co., and the Gnome engine, which will be in the booth of the General Vehicle Co.

The aeronautic industry of America is now firmly on its feet. This exhibition may be said to mark the laying of the foundation stone of a new industry which may in time drive off the automobile trade in volume. The Society of Automotive Engineers, having recently amalgamated with the Society of Aeronautic Engineers, has seized upon the occasion of the exhibition to hold a 1-day aviation meeting which will take place on Friday, Feb. 9. There will be two sessions, one in the afternoon and one in the evening, both being held in the Engineering Societies Bldg. The afternoon will be given over to the discussion of aircraft standards. A number of men prominent in the industry have promised to take part, and there will be two papers, one entitled "Necessity of Standardization in Metal Parts for Aeronautic Use," by F. G. Diffin, and the other is by J. J. Rooney, who will make some suggestions regarding standard performance tests for aeroplanes.

### Business in Afternoon

The afternoon session will really be a business session, in that the most important business of the industry just now is the standardization of details. It was recently stated that the chaos in the design of aviation engines is far worse than it used to be with automobile motors. For example: No engineer hesitates to use special bolts or special flanges in building an aviation engine, and there is no doubt that to permit a

greater saving of weight bolts for such machines will differ from those required by the automobile industry. For aviation a much higher class of material is employed on the average and this affects the proportions of all parts. Still, although the little fittings required for aviation engines may differ from those needed in automobile construction, they can still be standardized.

Then there is the question as to the extent to which the metric system of measurement should be used. As was stated in THE AUTOMOBILE editorial last week, there is a very strong argument in favor of the extensive use of a millimeter. This will have to be debated, since there are plenty of people prepared to argue the other way. One thing is quite certain, that in all standardization work the aviation industry is going to adopt popular methods with the work already done by the S. A. E. What might be called the business of standards remains in the same hands and will be conducted by the same office. Thus, if the aeroplane engineers make up their minds what they want, the machinery for giving it to them is ready and waiting.

### Evening Session Professional

The evening session will be purely professional, two papers being scheduled. One is entitled, Aerial Navigation Over Water, by Elmer A. Sperry, and the other, The Evolution of Aeroplane Wing Trussing, by Professor F. W. Pawlowski. Mr. Sperry's paper was originally scheduled for the winter meeting of the Society, but was among those which had to be taken by title, owing to lack of time for the discussion. It is also possible that Leigh M. Griffith will have some remarks to make on engine design.

There is no doubt that a great many automobile engineers who have so far taken no very strong interest in aviation will come to New York to see the exhibition, and any who have this intention should make a point of being present at the S. A. E. meeting, because the amount of information which will be given out in the papers in the discussion is bound to be very large indeed.

That the automobile and aviation industries are going to be

bound up together very closely is now quite certain. It is logical and natural but is by no means easy for an automobile engineer to turn to aviation work because the difference between a good automobile and a good aeroplane engine is extremely large, much larger than appears externally. The automobile engineer who wishes to get in touch with aviation has just got to make a very thorough study of the requirements, and there is no better way of gaining knowledge than

by attending a meeting where several different viewpoints will be discussed.

The S. A. E. will have a booth at the show where they will display, among other things, examples of standard parts and specifications which can be of interest to the aeronautic industry. All members of the Society are entitled to two tickets for admission, which they can obtain by application in person at the society headquarters.

## Constructional Details of Aeroplanes\*

THE first attempts in building a flying machine were imitations of the flapping wings of birds. The problem was: how to make the big wing surfaces light and rigid at the same time and how to arrange the members of the wing framing. The paper considers the wing trussing used in monoplanes, giving a brief historical account of the development. The early work of Henson (1842-43), Lillienthal (1896), Pilcher (1899) and others is described. The author gives high credit to the early work of Henson and states that in his wing construction is found all the essential elements of the modern aeroplane wing, such as the front and rear spars and main and secondary ribs. In 1909 Levavasseur adopted the Henson construction almost without change for his Antoinette monoplane, as shown in Fig. 1.

The paper also describes a number of other types of monoplane wing trussing used in modern machines. The first simple and statically clear structure to combine the planes in the so-called biplane was designed by a bridge engineer. It was Octave Chanute who first used the bridge-truss in the biplane. This was the Pratt truss and was adopted immediately by all the aeroplane builders. The standard type is shown in Fig. 2. This construction prevails at the present time, the number of panels on each side varying from two to four in various constructions.

The author then describes the trussing methods used in the overhung type aeroplane as developed by Henry Farman, in

the Ponier-Pagny, the Albatros and finally in the Curtiss machines, which make use of a wireless truss as shown in Fig. 3.

The paper states that trusses in triplanes can be treated along the same principles as in the biplanes and gives examples of correct and incorrect trussing for such machines. The subject of side bracing is considered at some length and illustrations are presented showing the construction used in a number of different machines.

The single-lift truss is compared with the double-lift truss. The author states that the only disadvantage of the former as against the latter is that it cannot be adopted for staggered biplanes. The single truss system has the following advantage, however. The strength of the struts varies as the least moment of inertia of the strut section. At a constant ratio of diameters of the strut section, the least moment of inertia varies as the fourth power of the thickness of the strut; and therefore the thickness of strut varies as the fourth root of the load that the strut can stand.

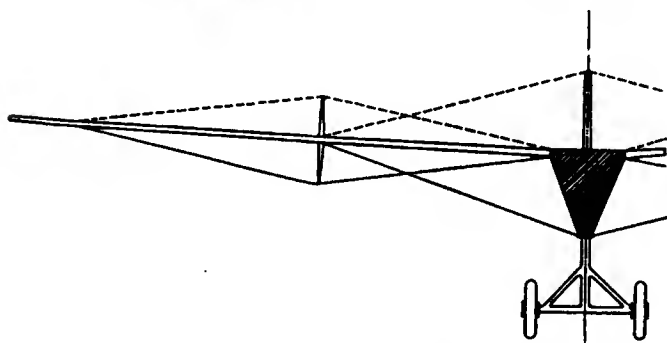


Fig. 1—Scientific form of trussing used first for experimental work in 1899 and adopted for the Antoinette monoplane. Below—Fig. 2—Standard type of biplane construction

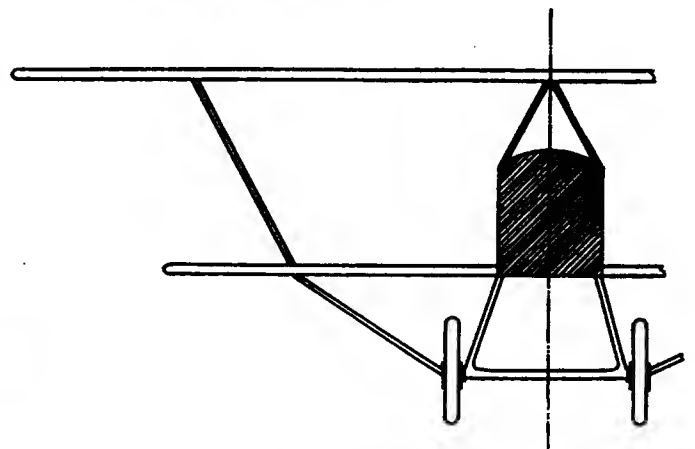
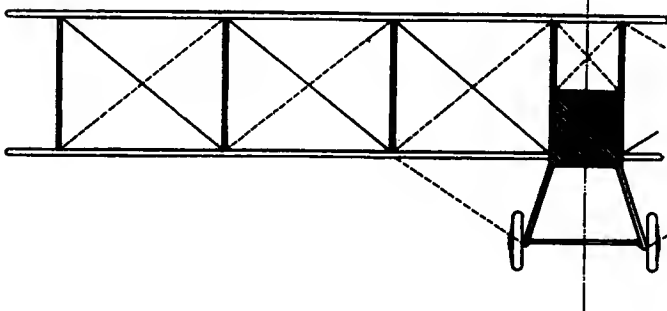


Fig. 3—Henry Farman design used for many machines, including the Curtiss

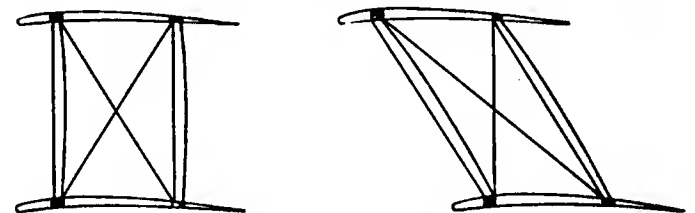


Fig. 4—Most common form of side bracing

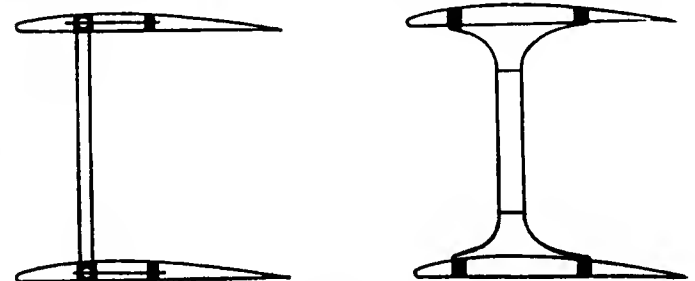


Fig. 5—Single lift, truss type of side bracing

\*NOTE.—Abstract of paper to be presented by F. W. Pawlowski, Assistant Professor of Mechanical Engineering, in charge of Aeronautic Course, University of Michigan, at the first Aeronautic Session of the Society of Automobile Engineers to be held Feb. 9, 1917.

Examples are given of side bracings of the so-called K-type, X-type, N-type and V-type. Fig. 4 shows the most common type of side bracing of biplane wings for machines of the so-called straight and staggered types. Fig. 5 shows a side bracing of the single-lift truss type; this was produced by Breguet in 1909. There are over 40 illustrations in the paper, showing almost every sort of constructional detail.

## Aeroplane Parts Need Standardization

**F**. G. DIFFIN of the Erie Specialty Co., states in his paper that having had a large experience in the manufacture of metal parts and fittings, he would like to make suggestions for the improvement of conditions. As an example, he cites the fact that on a well known type of aeroplane there are over 3000 different parts made on screw machines, these calling for from two to ten operations.

Regarding the products of different aeroplane manufacturers, he has noticed a bolt used for practically the same purpose on the different machines ordered in over sixty different lengths and in eight different diameters. Furthermore, these bolts are not even standard with regard to the proportions of their heads, and they are asked for in many different kinds of steel. The author rightly remarks that there cannot be any two opinions about the size of a bolt head. It is either right or too weak or too strong.

It will be remembered that when the Society of Automotive Engineers took upon itself to standardize yokes and rod ends it discovered an enormous number of varieties in use. This seems to be the case with the aeroplane to-day, Mr. Diffin's company being called upon to furnish several hundred different designs. Including the different variables, he states that nearly a thousand separate items have to be manufactured. The same condition prevails with regard to eye bolts, terminals and sundry other parts, one particular trouble being in connection with castle nuts, since these are often required in nickel steel and are very difficult to make in that material.

### Loss in Setting Up Tools

The sum total of all this is a large number of orders individually small. While Mr. Diffin remarks every order is called for with particular urgency, this means that an automatic machine tool cannot be started on a reasonably long run and quite a big proportion of the working day is to be charged to changing over and setting up machine tools.

Having regard to the fact that aircraft will require the very highest quality of materials, Mr. Diffin considers that the manufacture of small parts for aeroplanes will become a special business. To allow this business to develop properly will be to the greatest possible advantage to the aeroplane manufacturers, because it will allow them to purchase at shorter notice and at a much lower price. This means reasonable output and reasonable output of such things as bolts, yokes, etc., is only obtainable as a result of standardization. Mr. Diffin mentions the turnbuckle as being a part which will require special consideration. While it can probably be standardized it will be harder perhaps to obtain agreement as to the design than should be the case with bolts, rod ends and similar standard machine parts.

### Standards Would Increase Safety

After tabulating the gains which would result from standardization, important among which is the fact that the government or private users would be able to obtain spare parts much more easily if these were standardized, Mr. Diffin goes on to say that the safety of flying should be greatly increased by the use of standard small parts. He remarks, and quite rightly, that a firm like his own, handling many different

kinds of steel, has some difficulty in giving each its correct heat treatment, while in actual manufacture the smaller the number of parts to be made the more accurately can these be produced. The author makes a special appeal for consideration of the subject of steels, saying that "while at all times a high grade of material, far above the average commercial type, is demanded; full regard should be paid to the methods of economical production."

With respect to bolts, Mr. Diffin considers that 3½ per cent nickel steel is the best all-around material. He considers that a number of diameters now called for could be eliminated, and that a series of standard lengths could be set up. Dimensions of bolt heads must also be considered.

Regarding nuts, Mr. Diffin makes a plea for the use of cold rolled steel instead of nickel steel. First of all, these are much easier to make, especially when they are castellated, and secondly, it is easy to make the nut at least as strong as the bolt from which it fits even using a softer material for the nut than for the bolt.

## Cannot Define Gasoline

(Continued from Page 292)

At the Washington meeting all the oil companies, both large and small with but a single exception opposed any kind of legislation whatsoever. They opposed it for two reasons:

(1) Because they believe it impossible to define the meaning of gasoline without increasing the price or restricting supply.

(2) Because laws mean inspectors, inspectors mean graft, graft means increased price or decreased profit.

The chief reason that a definition of gasoline is going to be almost impossible to make is that nobody, neither oil man nor automobile engineer, is at present able to say what gasoline ought or ought not to contain. There are just two things which are certain about it. Taking the engine of to-day, the fuel for it must contain some proportion of highly volatile spirit to allow it to be started. It must not contain more than a very small proportion of spirit with less than a certain degree of volatility. But practically nobody at the conference was able to place any definite mark on these limitations.

In order to understand the situation it is necessary to appreciate the meaning of a distillation curve. In testing gasoline a small measured quantity is put in a flask and is boiled away, the vapor being condensed and led to a graduated measuring glass; in the neck of the flask is a thermometer. The accepted method is to observe the temperature at which successive proportions of the liquid have been boiled off. For example, the temperature may be read when 20 per cent has passed over into the condenser, again when 50 per cent is gone, and again at 90 per cent.

### Dry Point Important

Finally, as the last drop in the flask vanishes, we reach the "dry point" or "end point," where the temperature again should be observed. The temperature when boiling first starts is known as the initial point. A pretty good gasoline in the ordinary sense of the term would be something as follows: 25 per cent boiling off before reaching temperature of 225 deg. Fahr., 50 per cent boiling off before reaching a temperature of 265 deg. Fahr., 90 per cent boiling off before reaching a temperature of 340 deg. Fahr.; dry point, 400.

Now, there are very few gasolines on the market to-day with a dry point as low as 400; 450, which is well in the kerosene range, is quite usual. Dry points up to 500 are not uncommon. Furthermore, these high dry points can come in gasolines and be perfectly satisfactory in use. At present the engineers cannot say how high a dry point they are prepared to cope with. They cannot say how low an initial point they want. They cannot say whether they

want a curve which runs up very quickly and then goes along pretty nearly parallel to the base line; or whether they want a curve ascending in a smooth slope from the initial to the final temperature. The oil men apparently cannot help them.

Speaker after speaker after saying that the specification of gasoline was going to lead to trouble, to increased price and to waste (because we shall not need such volatile spirit next year as we need to-day), came eventually to the subject of fraud on the part of dishonest dealers and garagemen and others who handle the fuel.

#### Adulteration Frequent

A grave difficulty with gasoline is the large number of opportunities for adulteration which occur between the refining process and the time when the liquid goes into the tanks of the automobile. From the refiner the gasoline goes to the jobber, who buys from different sources and probably mixes different sorts by dumping different carloads in the same main tank. The jobber has the opportunity of adding to the gasoline something which he buys under a different name, such as kerosene or distillate. He may do this and yet produce a perfectly satisfactory fuel. There are gasolines on the market to be bought at the refineries which are actually improved by the addition of kerosene.

From the jobber the gas goes to the tank wagon, and a dishonest teamster has ample opportunity for adulterating the liquid it is his duty to deliver to the retailer. Six drivers in Detroit were recently caught making a fifty-fifty mixture of the jobber's gasoline and kerosene before delivering to the retailer. Finally, the retailer can again blend or mix just as the jobber can.

Here comes a very crucial point. If the refiner supplies a named or branded gasoline, the jobber who handles this or the retailer or anyone else who adds anything to it is guilty of fraud if from refinery to private motorist the product is sold under its brand all along the line. If, however, either jobber or retailer buys the branded gasoline, mixes something with it, and sells it as unnamed gasoline, he is not guilty of any fraud whatsoever.

It was reported to the bureaus by many of the speakers that a regular habit among a certain class of dealer is to buy a proprietary brand of gasoline and sell it at the marked figure—say, 18 cents—under its own name. They will take some of this, debase it by kerosene additions, and sell it under some fancy name of their own at a cent or two a gallon more, and the motorists buy the dearer product under the impression that it must be better. This, of course, is plain dishonesty, yet it is a kind of dishonesty which a few laws exist to stop. That it must be stopped somehow or other is obvious. Just how to stop it is at the present moment up to the Bureau of Mines and the Bureau of Standards, but they obtained very few concrete suggestions.

Throughout the country, legislatures, both State and municipal, are drafting bills to regulate the sale of gasoline. In a number of districts there are already laws in existence. Nearly all these legislatures are appealing to Washington to give them a rational basis for a law which will protect motorists from fraud, which will insure that when a man buys gasoline he gets what he wants, even although he is incapable of describing in scientific detail just what it is that he does want.

There is a very great deal to be said in favor of a definition of gasoline made by specified distillation curve limits. The fuel must be such that it will operate satisfactorily in a present-day engine. The engines of the future are going to burn almost anything in the way of liquid fuel. It will be a very short time before the motor which will both start and run on kerosene is at least as common as the gasoline engine. At that time what is to-day good gasoline will still be required to run the 3,000,000 cars now on our roads.

The other machines, according to their degrees of ability, will be satisfied by 80 per cent, 60 per cent, or less.

It would be quite easy to handle gasoline in this way just as alcohol is handled commercially. Nobody ever sees pure alcohol. It is always sold in mixtures with so much per cent alcohol and so much water. We can do just the same with gasoline. A manufacturer will advertise his vehicle to operate on say 50 per cent gasoline, and the chances are that if gasoline were defined to-day, next year or the year after dealers would have in stock a little 100 per cent gasoline and a large quantity of 60 or 70 per cent. By this means it is argued the motorist would be able to know what he was buying.

Another recommendation is that a definition be established with a view that it be revised from year to year as occasion demands. The great cry of the oil men is that if any recommendation is placed on what is gasoline it will limit the amount of suitable motor fuel which can be produced from the wells. They also seemed to hold a general opinion that if a dealer has two grades or rather is selling at two prices, the majority of people will buy the dearer liquid. No positive evidence was produced in support of this somewhat extraordinary claim, yet it was again and again stated that a dealer who had fuel at two prices sold most of the dearer quite without regard to the respective qualities. At the same time it was agreed that what the users want is the cheapest possible fuel which will run their engines. This was stated over and over again and flatly contradicts the other statement. It would seem likely that the truth is that the average man is anxious to get the cheapest fuel possible and believes that by paying a higher price he will get something which will make starting easier.

#### Gravity Test Useless

On one point, and on one point only, was there complete unanimity, this being that gravity is no longer of any value whatsoever in specifying a motor fuel. Any specification ought to be a measure of volatility. Years ago the gravity or the Beaumé was a measure of volatility, but it is so no longer. A heavy fuel to-day can easily be more volatile than a lighter one.

The meeting, as already stated, was very well attended and it would take a column or more to give the names of all the important people present. To give just a few as showing the character of the meeting may be mentioned Dr. W. M. Burton of the Standard Oil Co. of Indiana, C. D. Chamberlain, secretary National Petroleum Assn., Dr. F. C. Robinson, chief chemist, Atlantic Refining Co., Mr. Grant, secretary, Independent Oil Men's Assn., R. L. Welch, secretary, Western Oil Jobbers' Assn., Guy Stevens, chief attorney, the Texas Co., J. C. McCabe, head of the department of safety engineering of the City of Detroit, Otto H. Klein, Board of Estimate and Apportionment, New York City. The Society of Automotive Engineers was represented by A. Ludlow Clayden, ex-chairman of the Standards Committee and H. L. Horning, member of the Council.

Representatives of many other individual oil companies and of several States and cities were also there and it was very noticeable that the oil companies usually had two or more men representing the legal side and the technical side. The chief chemist and chief attorney were a very usual pair.

The meeting was most wonderfully handled by Dr. C. W. Waidner of the Bureau of Standards. In passing a most hearty vote of thanks to the bureau, it was remarked that Dr. Waidner and his associates had throughout the 12 hr. exhibited no prejudice but had taken up the points, asked questions and argued details for the sole purpose of extracting the maximum of information. The words of Mr. Saybolt of the Standard Oil Co. of New Jersey were that the oil men are strong for the bureaus and strong for the work they are trying to do, and above all, strong for the way in which they are endeavoring to do it.

# Worm-Gear Theory and Practice

## Part II

*THIS is the second of a series of articles extracted from the paper recently delivered by F. W. Lanchester before the British Institution of Automobile Engineers. This paper is of such length that it practically amounts to a text book on the subject. While it deals particularly with the advantages of the Lanchester or Hindley type of gearing, the portions devoted to worm and wheel mounting are applicable to the parallel type of worm gear also. It will probably rank as a standard work of reference for years to come.*

**I**N the modern worm mounting, the type of bearing given in Fig. 8 has been long since abandoned, and to-day it is the invariable practice to separate the functions of radius load and thrust and provide for each by a bearing specially designed for the purpose. Thus in Figs. 12, 13, 14, and 15 a roller bearing is employed independent of the thrust, and in Figs. 18 and 20 and those which follow, it will be seen that the radial bearing commonly used is the symmetrical type of ball bearing as now to be obtained from several firms such as the Hoffmann, Skefko, Duplex, etc., and the thrust is independently carried. In some cases the radial bearing takes the form of a roller bearing, as in the worm wheel bearings already given.

### Double Thrust Best

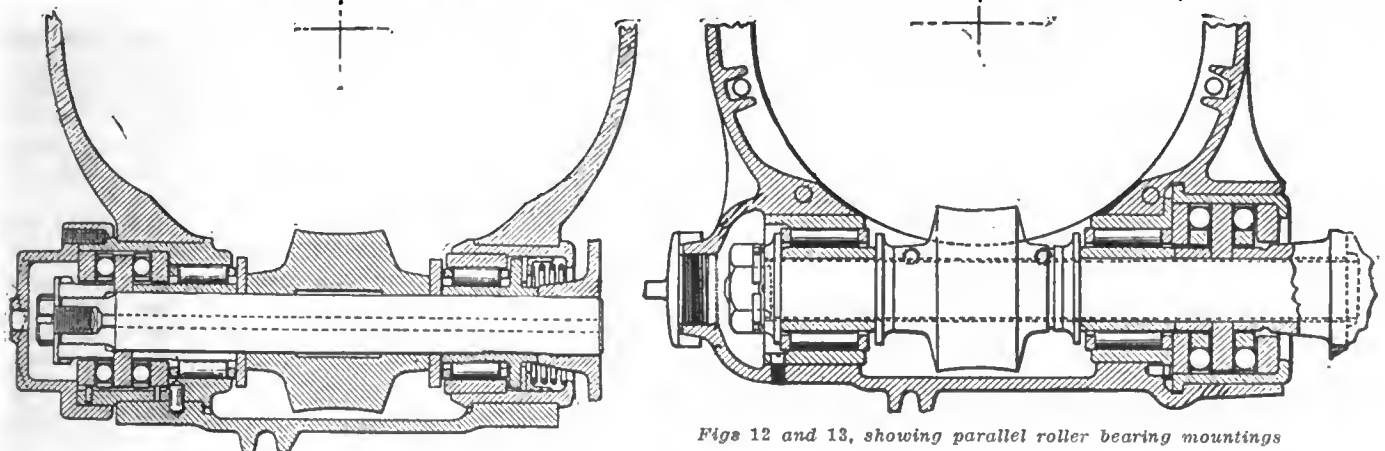
It is worthy of note that in the modern mountings, the thrust bearing, a double thrust, is almost invariably fitted at one end. Objection has been taken to this arrangement on the ground that any inequality of expansion between the worm shaft and casing will throw the worm out of center, in other words, the objection is based on the fact that the arrangement is unsymmetrical. There are two answers to this. Firstly, the temperature difference is a mere "bagatelle"; thus the whole range of temperatures between the hottest and coolest parts of the gear box is included between an atmospheric temperature, say, 20 deg. C. and an upper extreme of about 100 deg. C.; speaking generally, the difference between one part and another does not exceed 40 deg. C. or 50 deg. C. At the worst, calculation gives the relative displacement of the worm center line and the wheel center line due to heating as not exceeding two or three thousandths of an inch. In practice it is doubtful whether it is ever as great as this: in any case it has not been found to be detrimental.

Secondly, if, as is the only alternative, the thrust and counterthrust be arranged at opposite ends of the worm shaft, there will be a much bigger expansion difference to take up between thrust and counterthrust, probably twice as great as that now between worm and thrust bearing. This expansion might have a detrimental effect on the thrust

bearings and ultimately lead to their disintegration. The failure of a thrust bearing must be regarded as perhaps the worst "accident" which can happen to a worm gear while in service.

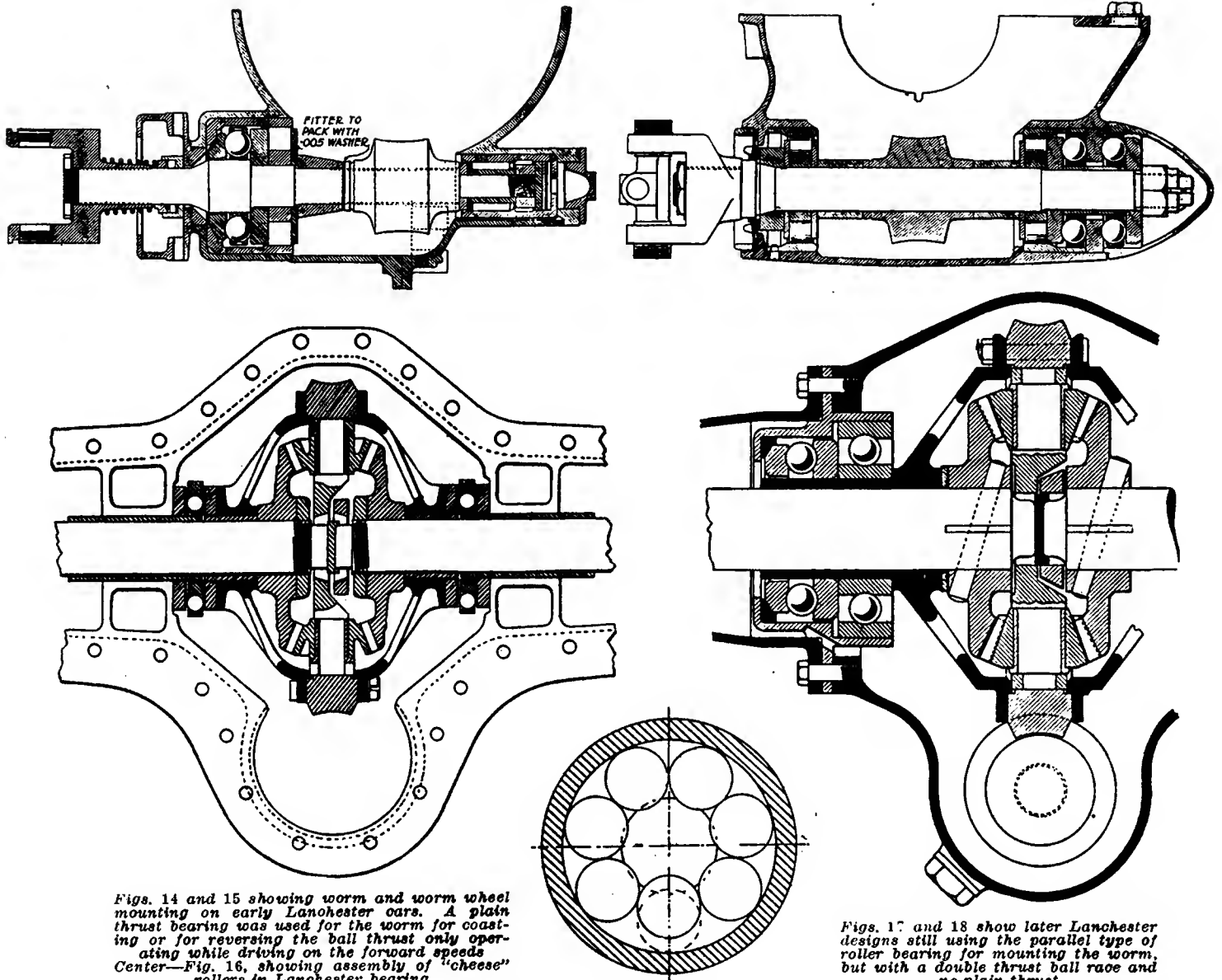
The author will now describe in detail a few of the later and more successful types of worm mounting, and some of those which are historically the more important. The first series which will be taken will be in continuation in Figs. 8 and 12, showing the historical development of worm mounting in the practice of the Lanchester Company. It will be noted on comparison of the figures given that there are certain features of the Lanchester mounting which have survived from the earliest designs, notably and which was used in the old Lanchester car built in 1897-8. The splined shaft on which the worm assemblage is mounted, also the method of building in the worm wheel as part of the balance gear box, and in providing for the housing in the worm wheel casting itself of the cross pin or pins on which the balance gear bevels are mounted. In this arrangement, which is common to the whole of the series, it will be seen that the drive from the bevel wheel is taken directly on the balance pinions, and the covers of the balance gear box are not used to convey torque but only the thrust and other forces by which the wheel is held in alinement. It will be noted that the thrust bearings serving the balance gear box take not only the worm thrusts but also the axle thrusts. There is a bronze pad fitted between the axle ends by which the thrust is conveyed from one axle to the other and thence to the thrust bearing. Another incidental feature which may be noted is the fact that there are four balance pinions in the differential gear box, each pair mounted on a transverse pin; the figures show clearly the means taken in the design of these cross pins to permit them to clear each other and to clear the axle ends and thrust pad. So far as the worm gear mounting is concerned, these are mere incidents, but the method by which the drive is conveyed from the worm wheel to the balance pinions is a matter which is essentially of interest.

Coming back now to the more directly important points, we may, with reference to Fig. 12, call attention to the first



Figs 12 and 13, showing parallel roller bearing mountings





advance in worm mounting after the type shown in Fig. 8. In this we see that roller bearings brought well up to the neck of the worm have been substituted for the bicycle type of bearing in the previous figure, and a double ball thrust between flat parallel races has been applied at the tail end of the worm shaft. This design, again, was before the period in which ball or roller bearings could be purchased from specialized makers, and the bearings were made in every detail at the Lanchester Company's works. It will be seen that the thrust bearing in this design is very compact, but from the modern point of view and with present day loads and speeds it would not be considered adequate. Owing to the incline of the worm shaft and the importance of ground clearance, the tail position is at a disadvantage compared to the driving end of the worm shaft in the matter of permissible diameter, hence, when we pass to a later design, Fig. 13, in which the bearings (both cylinder and thrust) are far more robust, the thrust is fitted at the neck or forward end. In Fig. 14 (early 20 hp.), we find that the ball thrust bearing has again been arranged at the forward end of the worm, and in this design an innovation was tried experimentally to do away with the ball counterthrust and employ a series of thrust washers, the efficiency clearly being a matter of no importance when the brake is being employed. A notable feature in this design is the very large diameter of the thrust balls. Fig. 15 gives the corresponding

section through the worm wheel axis. Here we see the spiral type of thrust bearing with flat races still holding its own.

A feature which is worthy of mention in many of these early mountings is the employment of the "cheese" type of roller bearing, that is to say, a type in which the length and diameters of the rollers are about equal. This is a type of bearing which the author developed in the experimental period of car building. The employment of this type of bearing was extended considerably in the 10-12 design in 1900, where it was used throughout the rear axle and parts of the countershaft. It is only within the last few years that bearings of this pattern have been taken up and introduced by the Hoffmann Mfg. Co. and others. There is a difference in practice inasmuch as the bearings marketed at the present day appear to be all fitted with cages, whereas in the author's experience a cage is absolutely unnecessary in bearings of the "cheese" roller type.

In any case the guiding of the roller is done from the ends, and this is really the definite distinction between the ordinary roller bearing and that of the "cheese" type in the former the roller being guided from its cylindrical surfaces, the cage being a necessity. Generally speaking, it has been the author's practice to so design the bearing that the rollers once in position could not fall out; thus, in the axle bearings shown in Fig. 9, the diameters of rollers and races were

such that the axle or central race could be removed and the rollers could not be displaced. The clearance was so small that the rollers would lock before they could come free.

A still later type of mounting is given in Fig. 17. On the worm bearings we again see the roller bearing of the cageless type employed, and a double thrust bearing on the tail end of the shaft. The whole outline of the worm housing, however, has been made very clean and smooth externally. The corresponding axle mounting is given in Fig. 18. Here it may be seen that on the axle bearing the ball has to some extent replaced the roller.

It may almost appear, in looking at these changes, that in some cases, in which the change goes from one arrangement to another, and then back again at a later date, there is certain evidence of infirmity of purpose. As a matter of fact, changes are frequently due to conditions which are temporary, and often two designs are so nearly equal in merit that whether one or the other be adopted is purely a matter of convenience. A great deal must depend upon whether the designer has a completely free hand or whether he is required to make use of standard components. It will be noted that amongst the various changes the practice of the Lanchester Company has always been to place the worm shaft below the axle.

#### Securing Alinement

One knotty point has existed throughout almost the whole history of gear box mounting, and that is the manner in which alinement is to be secured. There are four methods open: firstly, the parts may be made with sufficient mechanical exactitude to ensure perfect interchangeability and alinement within the necessary degree of accuracy. Secondly, a screw or other variable adjustment may be provided by which the necessary alinement may be secured in spite of individual variation in the parts. Thirdly, the method of using pen steel washers or "shims" may be adopted. Fourthly, an *accommodation piece* may be employed.

In the earliest type of mounting (already discussed, Fig. 8), the method of screw adjustment was employed, and up to a certain point was found satisfactory. It had the weakness, however, that, if the mountings were taken down, either the parts would have to be carefully marked, which might be forgotten, or in re-assembling an experienced hand would have to be employed,—who might not always be available. In brief, the screw adjusted mounting is not "fool-proof." In departing from this the author endeavored to attain perfection and prescribed limits to the components and methods of gauging by which complete interchangeability was secured. This ideal, however, is extremely difficult to get carried out. The number of parts in the "mechanical circuit" is great, and, in order to avoid excessive variation in the aggregate, the individual limits require to be unusually fine. So long as all the components are made in the same works as the car the thing can be done, and it has been successfully done by the Lanchester Company. The difficulty, however, arises when it is desired to increase the output and bearings have to be purchased from firms who specialize in such commodities; the degree of accuracy to which they will guarantee to work is totally inadequate, in other words, bearing makers will not guarantee to work to thickness limits or width limits less than five one-thousandths of an inch, and if such limits were tolerated the total inaccuracy in the case of a worm mounting would amount to as many hundredths of an inch as it should be thousandths.

The author has never found it cheaper to work to a low degree of accuracy than to work to a high degree of accuracy; in other words, a thrust bearing can be produced which from face to face does not differ by more than a thousandth just as cheaply as it can be produced to within two or three one-thousandths. Whatever difference of cost there may be is more than compensated for by the advantage of inter-

changeability. In other words, the actual production of a part accurately to dimensions, that is to say, within fine limits, may be slightly greater, but in any complex piece of machinery the saving in cost of assemblage will pay the bill many times over.

The above is no mere ideal or unsupported opinion, it is based on hard experience. Some years ago, in designing certain mechanism (which need not be specified) every clearance dimension and tolerance dimension was set personally by the author's own hands, and these were worked to for a considerable time with satisfactory results. A new works manager, who did not believe in working to fine limits, reported that the limits were unduly fastidious and that money could be saved by relaxing the limits and so avoid having to scrap parts. The managing director consented and the scheme was tried. A slight and questionable reduction resulted in the cost of manufacturing components, but the increased cost of assembling and testing, and the cost of rectifying complaints, etc., became so great that the initial saving was swallowed up many times over. Within twelve months the scheme was abandoned and the old fine tolerances were restored, the expense of twice altering the gauges, etc. being a dead loss apart from the disastrous results of the experiment. The author thinks he could go further and say that he has never made an endeavor to do anything *better* than previously, without finding that when it is being done better it is also being done *cheaper*. Thus, the "splined shaft" was looked at by some as a piece of fantastic extravagance when first introduced, but it showed itself to be a money saver from the outset; it is far cheaper to cut a splined shaft and drift the hole to correspond, than it is to cut a key way and make and fit a key; also the job is incomparably better engineering when done. It is, perhaps, the more legitimate to cite this example since it was in connection with worm mountings that the splined shaft was first introduced into motor car practice; the worm shaft of the 10-12 hp. Lanchester car, Fig. 8, also the gear box, were, the author believes, the first applications of the splined shaft in the history of automobile engineering.

#### Interchangeability Difficult

Returning to the main point under discussion, it has been stated that though commercially possible, and probably advantageous, to fix the limits of the various components to secure perfect interchangeability in a worm gear mounting, it can only be done provided that the whole of the parts are made by the builders; at least in cases such as ball or roller bearings the offending dimensions must be rectified after they have been received from the manufacturer. There are commonly some eight parts or thereabouts of which the tolerance differences accumulate, and to attain perfect interchangeability the whole sum of these must be kept down to within four or five one-thousandths of an inch.

Admittedly the individual limits are fine. Owing to the difficulty of obtaining the necessary interchangeability, especially where ball bearings, etc., were ordered from outside sources, the Lanchester Co. have from time to time resorted to an accommodation piece, or have made use of "shims" in order to secure the necessary accuracy of alinement. There is more to be said in the case of a worm gear mounting for this practice than might appear to the idealist; it is, for example, admitted that the various components, thrust bearings, etc., are liable to a certain amount of wear; occasionally, also, the whole assemblage will be found to have developed internal slack, in which case the components may undergo considerable "punishment" and additional inaccuracy is introduced. Under these conditions the use of shims in the repair shop is fully justified, and a very good job indeed can be made if the points at which the shims are inserted are such as to present a sufficient area, and if the shims themselves are of pen steel or other suitable

hard grade of material. If this be not the case, there is always the danger of the shims being spun out or hammered out, and eventually disintegrating, in which case the parts may get loose in the gear box.

#### The Accommodation Piece

There is also the fourth expedient above given: the *accommodation piece*. In all interchangeable work in mechanical engineering a point may ultimately be reached when the accumulation of the tolerances of the individual components results in the individual limits having to be cut down to a point below anything which may be considered reasonable. It then becomes a question of judgment for the designer (as in the case of the worm gear under discussion) how the difficulty is to be met: one method is that of the *accommodation piece*. Thus one piece in the whole "mechanical circuit" is left to be fitted, or is made in several different standards of thickness. This is far better practice than to have a pretended interchangeability which does not really exist in which the accumulated tolerances do not come within the aggregate limit, and which in the assembling of a machine has to depend upon the *selection of compatible components*. Thus, on many pieces of mechanism at present being manufactured for the Government there are limits specified on the aggregate assemblages which are inconsistent with the limits permitted on the individual components, so that a manufacturer may make his components within the limits specified and yet he may not have a single assemblage which will go together. It is frequently true that it would be far easier to put finer limits on the individual components and devise means of working to them, but obviously, as already stated, there is a limit to what is commercially possible. When this limit is reached the alternative to the very unsatisfactory state of things above described is to make one of the components an *accommodation piece*, and either admit that part as a fitter's job, that is to say, allow it to

be filed or otherwise adapted to the rest of the assemblage, or else to make that particular part in sufficient variety and confine the *selecting* to that one particular component.

In the worst or extreme cases given by these dimensions the difference amounts to 0.01-in. in the worm and wheel location; this may be taken as within the limits of good practice. It is clear from this example that a very high degree of accuracy in manufacture is necessary.

#### Difficulty with Shims

The difficulty mentioned in the case of "shims," namely, that they are liable to be spun or beaten out, is a difficulty met with more broadly and in a more general way in worm gear mountings. The parts intervening between the thrust and the worm appear in practice to need to be able to stand a lot of "punishment," and it is most important that no backlash shall exist. The consolidation of the worm shaft assemblage is usually provided for by pulling the whole string of components, namely, worm, distance piece, bearing ring, thrust washer, etc., thoroughly solid by a nut of ample proportions, as may be seen from the various figures. In some cases this nut has been locked by means of a caulking plate, in other cases the customary split cotter has been employed. Where the latter practice is adopted it is important that the nut shall be pulled thoroughly home before the hole is drilled for the split cotter, and even under these conditions there are certain objections to locking in this way. Owing to the trouble which has been found to develop if any initial backlash once makes its appearance, it has been the author's practice for some time to specify that all the components forming this compression assemblage shall be hardened, either being made of a high carbon steel or case-hardened according to circumstances. When this precaution is taken, and when the abutting areas are made sufficient, all trouble from the cause stated has been found to cease.

(To be continued)

## Houdaille Shock Absorber of Hydraulic Type

**H**OUДАILLE hydraulic suspensions are built on the same basic principle as the recoil-absorbing devices in use on cannon, no frictional disks, equalizing springs, air compression, etc., being employed. Positive action is secured by using a rotary paddle type piston to compress castor oil and to force it through by-passes, subjecting it to abnormal pressure and thus automatically tempering the shock of excessive spring action. Recoil is prevented by the return of the oil from the compensating reservoir by means of suction.

Since the shock-eliminating effect is secured by passing the castor oil through the by-passes mentioned these passages must be more or less opened or closed, depending on the strength of the recoil of the car springs. Refilling the compensating reservoir once or twice a year with castor oil or glycerine is stated to be all that is necessary to maintain perfect working conditions. The reason for the use of one or the other of these liquids is that change of temperature does not alter their viscosity. When the temperature is much below freezing, however, the valve must be opened somewhat, the regulating operation consisting in turning a single screw connected with an indicator.

The manufacturer points out that

Houdaille suspensions can be easily installed in any garage or repairshop. The accompanying illustrations show two methods of mounting. Fig. 1 shows the best manner for fitting the suspension to the rear axle. If the gasoline tank interferes with mounting the suspensions behind the axle they can be attached on the front side so as to be accessible for regulating and filling from the interior of the car by lifting the floorboards. Fig. 2 illustrates the method of attaching the suspension in cases where there is no convenient way of fitting to the axle.

When fitting the suspensions to the car care should be taken to see that the lever arm is horizontal when the car is loaded and that the vertical rod with ball joint at each end is perpendicular to the ground. Of course, it must be seen that the horizontal lever arm is entirely free to travel above and below the horizontal in accordance with spring flexure without interference.

The Houdaille Shock Absorber Co., Inc., 1737 Broadway, New York, was formed recently to push the manufacture of Houdaille suspensions in this country, the devices having previously been produced abroad, although Paul V. Clodio, who is interested in the new company, has controlled the patent rights in this country for years.

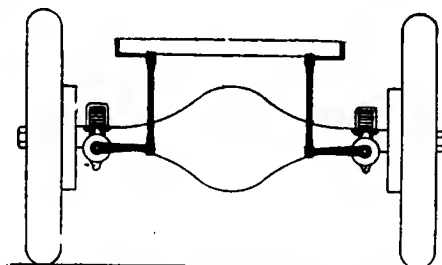
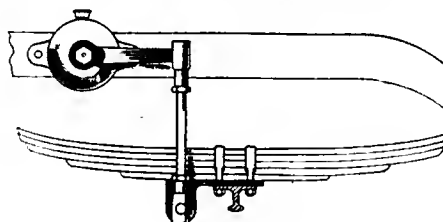


Fig. 1—Attached to rear axle. Fig. 2—Attached to chassis frame



# Industrial Miscellany

Winton Motor Car Co., Cleveland, will erect an additional \$18,000 factory building in the near future.

Harris Automatic Machine Co., Niles, Ohio, will remove to Cleveland and occupy a \$110,000 factory now being erected.

Aeromarine Plane & Motor Co. is having a factory built at Keyport, N. J., to be ready in a few months.

Sioux City Tire & Mfg. Co., Sioux City, Iowa, has let a contract for a \$25,000 plant to be ready for occupancy next fall.

General Tire & Rubber Co., Akron, has been granted a permit to build a \$50,000 addition to its plant.

Richard Auto Mfg. Co., Cleveland, plans to build factory extensions at 7800 Finney Avenue costing \$40,000.

Sterns Tire Co., St. Louis, will turn out 1200 Sternwear tubes daily after

Feb. 15 at the remodeled Efficiency Oil Co. plant, owned by the former company.

Huron Tractor Co., Detroit, will build a plant at Port Huron, Mich.

Goodyear Tire & Rubber Co. has started work on a 7-story, 110 x 120-ft. addition to its plant at Williamsville, Conn.

Ten Broeck Tyre Co., Louisville, Ky., will install cotton mill machinery in its plant and spin yarn and weave cotton fabrics.

Commercial Body Co., Bay City, Mich., a newly incorporated company, plans to build a factory.

Mayo-Skinner Mfg. Co., Chicago, will enlarge its production of automobile appliances by building a factory on Elston Avenue.

Willard Storage Battery Co., Cleveland, has taken out permits to build a \$25,000 coal-handling plant and an \$18-

000 addition to its main building in East 131st Street.

Fisher Body Corp., Detroit, is erecting a new five-story factory having the latest modern improvements.

Packard Motor Car Corp., Detroit, has 9,000,000 lb. steel in its factory reserve material to protect the company against any shortage in the market.

Davis Mfg. Co., Milwaukee, has broken ground for a new machine shop at West Allis, Mich.

Acme Tire & Rubber Co., Toronto, Ont., plans to build a factory at Oakville, Ont.

Tuthill Spring Co., Chicago, has introduced new spring leaf fitting machinery into its factory.

Lasure Friction Clutch Pulley Co., Charles City, Ia., manufacturing clutch units for gasoline engines, has removed its plant and general offices to Madison,

## The Automobile Calendar

### ASSOCIATIONS

Feb. 13-14—St. Joseph, Mo., National Annual Convention Pikes Peak Ocean to Ocean Highway Assn.

### CONTESTS 1917

April—Los Angeles to Salt Lake City Road Race.  
 May 19—New York Metropolitan Race on Sheepshead Bay Speedway.  
 May 30—Indianapolis Speedway Race, Championship.  
 June 9—Chicago, Ill., Speedway Race, Championship.  
 June 23—Cincinnati, Ohio, Speedway Race.  
 July 4—Omaha, Neb., Speedway Race, Championship.  
 July 4—Tacoma, Wash., Speedway Race, Championship.  
 July 14—Des Moines, Iowa, Speedway Race, Championship.  
 Aug. 4—Kansas City Speedway Race.  
 Sept. 3—Cincinnati, Ohio, Speedway Race, Championship.  
 Sept. 15—Providence, R. I., Speedway Race, Championship.  
 Sept. 29—New York, Speedway Race, Championship.  
 Oct. 6—Kansas City Speedway Race.  
 Oct. 13—Chicago, Speedway Race.  
 Oct. 27—New York Speedway Race.

### SHOWS

Jan. 27-Feb. 3—Richmond, Va., First Annual, Gray's Armory.  
 Jan. 27-Feb. 3—Columbus, O., Show, Memorial Hall, Columbus Dealers' Assn.  
 Jan. 27-Feb. 3, 1917—Chicago, Ill., Show, Coliseum, National Automobile Chamber of Commerce.  
 Jan. 27-Feb. 3—Portland, Ore., Eighth Annual, Dealers' Motor Car Assn. of Oregon.  
 Jan. 27-Feb. 5—York, Pa., Show, York Automobile Dealers' Assn.  
 Jan. 28-Feb. 3—Wilmington, Del., Show, Hotel duPont.  
 Feb. 3-10—Minneapolis, Minn., Show, Minneapolis Automobile Trade Assn.

Feb. 5-9—Boston, 8th National Good Roads Show, Mechanics' Bldg.  
 Feb. 5-10—Indianapolis, E. W. Steinhart Bldg., Indianapolis Automobile Trade Assn.  
 Feb. 5-10—Bangor, Me., Bangor Automobile Assn., Auditorium.  
 Feb. 5-10—Indianapolis, Ind., Indianapolis Automobile Trade Assn., Steinhart Bldg.  
 Feb. 7-9—Washington, Pa., Washington Automobile Dealers' Assn., Washington Amusement Co. Rink. C. E. McAllister, Sec.  
 Feb. 7-10—Bay City, Mich., Automobile and Accessories, Armory, F. D. Shaver, Mgr.  
 Feb. 7-11—Kalamazoo, Mich., State Armory, Kalamazoo Automobile Dealers' Assn.  
 Feb. 8-15—First Pan-American Aeronautic Exposition, New York City; Aero Club of America, American Society of Aeronautic Engineers, Pan-American Aeronautic Federations.  
 Feb. 10-17—Harrisburg, Pa., Harrisburg Automobile Dealers' Assn., J. Clyde Myton, Mgr.  
 Feb. 10-17—Hartford, Conn., Show, State Armory, First Infantry.  
 Feb. 10-18—San Francisco, Cal., Pacific Automobile Show, G. A. Wahlgreen, Mgr.  
 Feb. 12-17—Bay City, Mich., Show, Armory.  
 Feb. 12-17—Louisville, Ky., Show, First Regiment Armory, Louisville Automobile Dealers' Assn.  
 Feb. 12-17—Toledo, O., V. G. Kibby, 1017 Jefferson Ave.  
 Feb. 12-19—Indianapolis, Ind., Show, Steinhart Bldg., Indianapolis Automobile Trade Assn.  
 Feb. 13-15—Grand Forks, N. D., Auditorium, Automobile Dealers' Assn.  
 Feb. 13-17—Williamsport, Pa., Armory, John Kelly, Mgr.  
 Feb. 14-17—Peoria, Ill., Coliseum, Automobile and Accessories Dealers' Assn.  
 Feb. 15-17—Racine, Wis., Chas. A. Myers, Mgr.

Feb. 17-24—Albany, N. Y., Sixth Annual, State Armory, Albany Automobile Dealers' Assn.  
 Feb. 18-25—St. Louis, Mo., Show, Automobile Manufacturers' and Dealers' Assn.  
 Feb. 19-24—Springfield, Ohio, Show, Memorial Hall, Springfield Automobile Trade Assn.  
 Feb. 19—Pittsfield, Mass., Show, Armory, J. J. Callahan, Mgr.  
 Feb. 19-24—Portland, Me., Exposition Building.  
 Feb. 19-24—Grand Rapids, Mich., Show, Automobile Business Assn. of Grand Rapids.  
 Feb. 19-24—Duluth, Minn., Show, Duluth Auto Dealers' Assn., Armory.  
 Feb. 19-24—South Bethlehem, Pa., Show, Coliseum.  
 Feb. 19-24—Bridgeport, Conn., Show, Armory, Coast Artillery Corps.  
 Feb. 19-24—St. Louis, Overland Bldg., St. Louis, Auto Dealers' Assn.  
 Feb. 19-24—Syracuse, N. Y., Show, State Armory, Syracuse Dealers' Assn.  
 Feb. 19-24—Pittsfield, Mass., J. J. Callahan, Mgr.  
 Feb. 21-24—Flint, Mich., Coliseum, Lake Side Park, E. W. Jeffers, Mgr.  
 Feb. 24-Mar. 3—Newark, N. J., Show, First Regiment Armory.  
 Feb. 24-Mar. 3—Brooklyn, Show, 28rd Regiment Armory.  
 Feb. 24-Mar. 3—Atlanta, Ga., Automobile Dealers' Assn., Auditorium.  
 Feb. 26-Mar. 3—Omaha, Neb., Show, Auditorium, Omaha Automobile Show Assn.  
 Feb. 26-Mar. 3—Utica, N. Y., Utica Automobile Dealers' Assn., State Armory.  
 Feb. 26-Mar. 3—Wilkes-Barre, Pa., Hugh B. Andrews, Mgr.  
 Feb. 27-Mar. 4—Atlanta, Ga., Show, Auditorium, Atlanta Auto Trades and Accessory Assn.  
 March 1, 2, 3—Urbana, Ill., Show, Automobile Trade Assn. of Champaign Co., Armory of the University of Ill.

March 3-10—Boston, Mass., Show, Mechanics' Bldg., Boston Automobile Dealers' Assn.  
 Mar. 3-10—Washington, D. C., Middle Atlantic Motor Assn., Inc., Union Bldg.  
 Mar. 5-10—Jamestown, N. Y., Jamestown Automobile Dealers' Assn., Armory. C. A. Hanvey, Mgr.  
 Mar. 5-12—Birmingham, Ala., Auditorium.  
 Mar. 6-9—Fargo, N. D., A. Hanson, Mgr.  
 March 6-10—Ft. Dodge, Iowa, Northern Iowa Show, New Terminal Warehouse, G. W. Tremain, Secretary.  
 March 7-10—St. Joseph, Mo., Auditorium, St. Joseph Automobile Show Assn.  
 Mar. 12-17—Vancouver, B. C., British Columbia Automobile Assn., Horse Show Bldg.  
 March 13-16—Fargo, N. D., Armory and Auditorium.  
 March 14-17—Mason City, Ia., Armory, Mason City Automobile Dealers.  
 March 14-17—Davenport, Iowa, Show, Coliseum Bldg., Tri-City Auto. Trade.  
 Mar. 17-21—Manitowoc, Wis., F. C. Borchardt, Jr., Mgr.  
 March 17-22—New Haven, Conn., Show, Hotel Taft.  
 Mar. 17-24—Pittsburgh, Pa., Motor Square Garden, J. J. Bell, Mgr.  
 March 18-23—Cedar Rapids, Ia., Cedar Rapids Automobile Trades Assn.  
 Mar. 19—Paterson, N. J., Sixth Annual, Auditorium, R. A. Mitchell, Mgr.  
 Mar. 21—Trenton, N. J., Second Regiment Armory. J. L. Brock, Mgr.  
 Mar. 27-31—Deadwood, S. D., Fifth Annual, Deadwood Auto Show. J. E. Nelson, Mgr.  
 Mar. 31-Apr. 14—Atlantic City, Garden Pier, S. W. McGill, Mgr.  
 April—Calumet, Mich., Show, Coliseum, Frank Ketchell, Mgr.  
 Apr. 4-7—Stockton, Cal., Second Annual San Joaquin Auto Trades Assn., Samuel E. Cohn, Mgr.  
 Sept. 2-9—Spokane, Wash., Interstate Fair.

Wis. The factory at 619 Williamson Street, Madison, has been equipped and is now producing fifty clutch pulleys daily.

## Personals

C. A. Bonniwell has joined the staff of H. Walton Heegstra, Inc., merchandising and advertising service, of Chicago. Mr. Bonniwell for the past 2 years has been assistant sales and advertising manager of the Auburn Automobile Co., Auburn, Ind.

F. C. Rockwell, a former well-known Boston automobile dealer, has taken the Metz agency for Los Angeles, Cal., where he has gone into partnership with B. I. Carpenter and R. I. Carpenter, both New York automobile men.

E. M. Nolen and F. W. Thurnau have joined the staff of Vanderhoof, Condict and Comrie, advertising agents of Chicago. Mr. Nolen is vice-president and director of merchandising. He has been associated with the advertising work of Stutz, Cole, Pathfinder and other automobile companies. Mr. Thurnau has been with Dunlop Ward Co. for 3 years.

W. F. Hirst has resigned his position as factory manager of the Brown Lipe Gear Co., Syracuse, N. Y. He will announce his plans shortly.

F. E. Brown will open the Southern branch of the Ohio Puncture Plugger Sales Co., Columbus, Ohio, at New Orleans early in February.

Allan R. Pye and Charles Helm have been elected vice-president and secretary respectively of the Britton Co., Hartford, Conn. They were taken into the firm in recognition of their work as the two employees oldest in the service.

William Nantarro has been appointed superintendent of the body building department of the Kent Motors Corp. factory, Newark, N. J. He was formerly with J. M. Quinby & Co., Newark.

F. W. A. Vesper has been elected a director of the St. Louis Chamber of Commerce. He is president of the Vesper-Buick Automobile Co.

L. G. Peed has joined the staff of the Willys-Overland Co. in New York. He was formerly manager of the Philadelphia branch of the Maxwell Motor Sales Corp.

S. D. Briggs of Minneapolis, northwestern representative for the Hupmobile, has sailed for a tour of France, England, Spain, the Far East and other countries in the interests of the Hupmobile.

M. A. Purvin has been made manager of the Chicago office of the United Smelting & Aluminum Co., New Haven.

Roy L. Sergeant has been appointed general manager for the Pacific Coast for the Fisk Rubber Co. He was formerly in charge of the south coast district.

Nelson T. Scott has been appointed superintendent of traffic of the Kent Motors Corp., Newark, N. J. He was formerly with the American Electric Works.

Walter Brady has resigned from the sales department of the United States Tire Corp., Detroit. He will announce his new connection later.

## Dealers

Firestone Tire & Rubber Co. opened its handsome new service station at Los Angeles on Jan. 31 with a city-wide celebration in which municipal officials and

delegates from all parts of the Far West participated. The building is three stories high and has 30,000 sq. ft. of floor space. It is built of stucco and reinforced concrete, ornamented with Egyptian tile and having mission balconies. It has a storage capacity of 7500 casings.

McMullen & Lee, Chevrolet representatives in Toronto, have also acquired the selling rights for the Studebaker for Toronto and district.

Tire Service House, Seattle, has moved from its old quarters on East Pike Street near Broadway to its new home at 615 East Pine Street.

Pacific KieselKar Co., Portland, Ore., has taken the agency for the Ford car in Portland and surrounding territory in western Oregon.

Arensburg Automobile Supply Co., Seattle, has moved from its quarters at the corner of Summit Avenue and Pine Street to 906 East Pike Street.

Seattle Branch of the Pacific KieselKar Co. has taken the agency for the Federal truck. The Gerlinger Motor Car Co. of this city, which has been handling this agency for the last 2 years, will hereafter sell the Gersix truck.

Willard Storage Battery Co. is erecting a two-story garage and service station in Detroit.

Waterhouse-Sands Motor Car Co., Seattle, has taken the agency for the Kelly-Springfield tires in Seattle and vicinity, with D. H. Coulsin as manager.

Tennessee Auto Sales Co., Memphis, Tenn., will handle Troy trailers in the State of Tennessee and northern Mississippi.

L. C. Auto Co., Jackson, Mich., has been incorporated to handle Jackson, Peerless and Federal truck lines in that territory. It will occupy a new service station at 218 West Pearl Street about April 1.

Maxfer Truck & Tractor Co., Chicago, has named Genereux & Co., 5-7 Houston Street, as distributors for New York, and Nickerson & Schroeder, 1078 Bedford Avenue, for the Greater New York territory.

H. G. Moock, Denver, Woods distributor for Colorado and Wyoming, has added Mercer distributing agency for same territory.

Ouray Motor Sales Co., Ouray, Col., has secured Dodge agency for Ouray County.

MacFarland Auto Co., Denver, for several years Packard and Buick distributor for Colorado and part of Wyoming, has sold out the Packard business and is handling Buick exclusively in same territory.

R. E. Williams Motor Car, Denver, Abbott-Detroit distributor for Colorado and part of Wyoming, has added the Peerless retail agency for Denver and vicinity.

Lexington Colorado Auto Co., Denver, has opened a Lexington distributing agency for Colorado, Wyoming and New Mexico at 721 Seventeenth Street.

Overland Stores Co., Toledo, Ohio, John Willys, president, has contracted for the erection of a three-story building for sales and service purposes in Detroit.

Chalmers cars will be handled in Memphis (Tenn.) territory by Eugene Polk, who has opened a sales and service establishment. Mr. Polk was formerly the Chalmers agent at Little Rock, Ark.

Southern Auto & Electric Co., Little Rock, Ark., has taken the Westcott.

Service Auto & Ignition Co., Denver, has opened an agency and official service station for Eveready storage batteries

and Westinghouse, Bijur, Dyneto and Disco starting and lighting systems.

Bour-Davis Motor Car Co., Detroit, is appointing district sales managers for the entire United States.

Canadian Auto Sales Co., Ltd., 145 Bay Street, Toronto, Ont., has been appointed distributor of the Velie and Hollier cars.

Brewer Motor Co., eastern Washington distributors of the Saxon, has established a branch in Walla Walla, Wash., to handle Walla Walla and Columbia Counties. J. P. Welch has been appointed manager of the branch.

Oregon Motor Car Co., Portland, Ore., has been appointed agent for the Locomobile Company of America in the State of Oregon.

Des Moines branch of the Michelin Tire Co. has been closed and the Michelin business for the State has been taken over by the Hippee Motor Supply Co.

Mackie Motor Co., Des Moines, Iowa, will take over the State of Iowa for the sale of the Chalmers. The Iowa Auto & Supply Company, which has held the Chalmers agency here for several years, discontinued same on Jan. 1 to take on a new line of cars.

Ballou & Wright, Seattle, have taken the western Washington agency for the Smith junior car.

A. J. Miller Co., Bellefontaine, Ohio, will erect a three-story plant to use for assembling automobiles and for offices.

V. E. Schevenell Co., Memphis, Tenn., has been named distributor for Princes cars in Tennessee, Alabama, Mississippi and Arkansas.

P. J. Durham Co., 244-250 West Fortyninth Street, New York, has opened a Newark, N. J., branch at 23 Central Avenue as New Jersey headquarters for the distribution of Gray & Davis products.

Peerless Motor Car Co., Cleveland, has appointed the Morgan-Farr Motor Co., Newark, N. J., distributor over the northern New Jersey territory. This company also handles the Munroe.

Edgar F. Sanger Co., 156 Farwell Avenue, Milwaukee, distributor of Stearns-Knight and Hupmobile cars, has incorporated the business under the same style. The capital stock is \$25,000. E. F. Sanger is president and general manager of the company.

Republic Motor Car Co., Cole distributor, has also taken the Maxwell.

A. F. Hieronimus, Jr., Columbus, has taken the central Ohio agency for the Haynes.

White Motor Sales Co. has been organized to handle the White line in Columbus, including both cars and trucks.

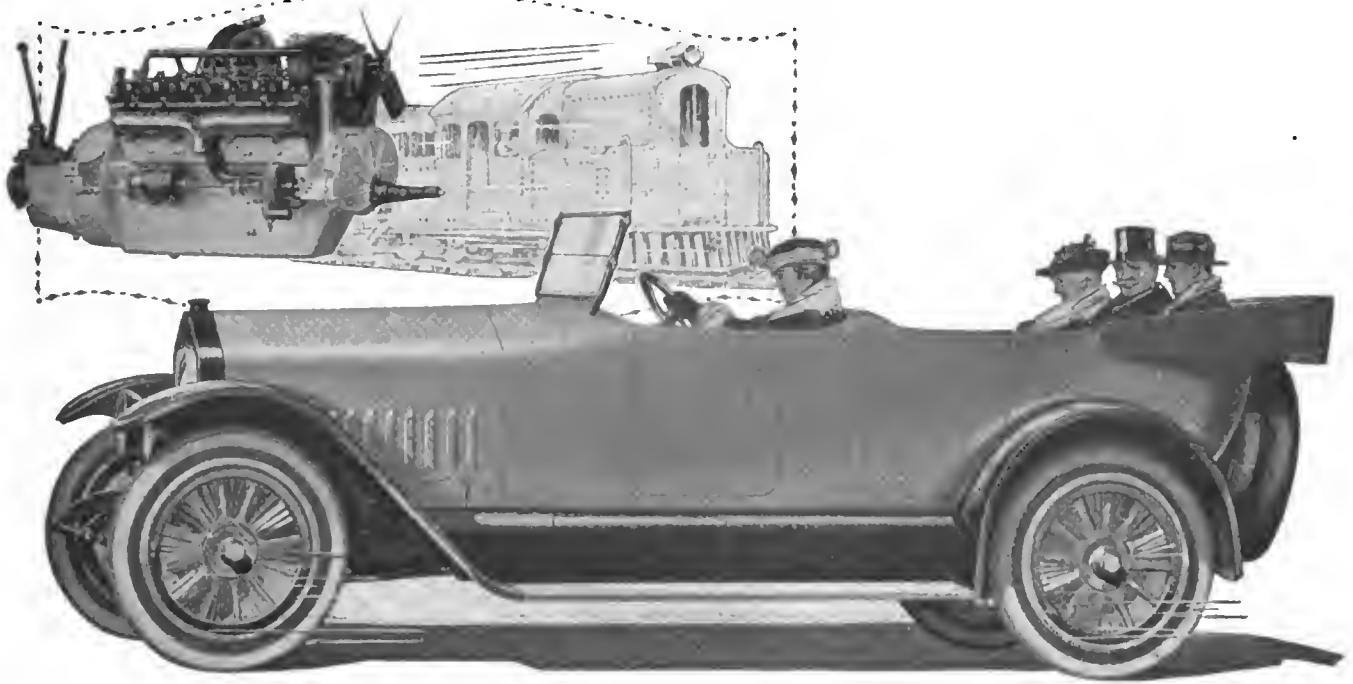
La Crosse Auto Co., Minneapolis, selling the Dort, has moved to new quarters at 1203 Hennepin Avenue.

Ben Hur Co., St. Louis, A. H. Truscott, manager, has leased space in the Plaza Hotel building, 3306 Locust Street.

Day-light Garage, 345 East Thirty-third Street, Baltimore, Md., is distributing the Acme truck in this city. Anne Arundel, St. Mary's, Hartford, Cecil and Prince George's counties.

Chevrolet Northwest Co., Seattle, Wash., will hereafter be known as the W. S. Dulmage Motor Car Co.

Bimel Motor Car Co., St. Louis, has been organized to sell Bimel cars. The new company has rented display space from the Bart S. Adams Tire Co., 4701 Washington Avenue.



# National Silent Power

## Third Series of Twelves A NEW MODEL

National built motors have always been abreast, and generally ahead of the industry. When four cylinders were the proper thing, National built the world's Champion Fours. When sixes came into vogue, it was National that built the first American Sixes and National Sixes of today are the highest development of that type. National was a pioneer in the latest type motor—the Twelve Cylinder.

National Twelve Cylinder cars are today in operation in every state in the Union and in eleven Foreign countries. Owners everywhere testify to the success of the Twelve.

The same corps of engineers who have produced previous successes, have within the last year, concentrated on improvements for this third National Twelve.

### NEW FEATURES

Removable cylinder heads to facilitate cleaning and inspecting.

Increased size of cylinder with corresponding increase in power.

Balanced crankshaft—another power increasing improvement.

Heated intake manifold to handle effectively the low grade fuel.

Larger main bearings reduce the vibration in a practically vibrationless motor.

Valves on outside of V continued together with new design valve lifters make National Twelves most accessible of all V motors.

Independent electrical units—Delco for Ignition and separate, independent Starting and Lighting units.

¶ This new Twelve is the last word in multi-cylinder efforts to achieve perfection.

¶ From low to high speed—and at every stage in between—there is the same *high pressure* of power, even, supple and subject to your perfect control.

¶ In short, it is a marvelous motor—not to be appreciated until driven.

¶ To be the National dealer is not only to have the best motor to demonstrate, but to have the best of *everything* to offer customers.

HIGHWAY TWELVE \$2150

HIGHWAY SIX \$1750



Cylinder  
\$2150

## AMERICAS BEST LOOKING CARS

National Motor Car & Vehicle Corp., Indianapolis

Seventeenth Successful Year



Cylinder  
\$1750

Please mention The Automobile when writing to Advertisers



Choose a radiator with even more care than in selecting all other car components. Its quality and ability are vital for best engine performance.

THE  
**HARRISON**  
 ORIGINAL HEXAGON  
**CELLULAR RADIATOR**

with its peculiar horizontal arrangement of cells means lighter weight and greater durability.

NOTICE ITS WORK ON THESE CARS:

**CHANDLER—HUDSON—HUPMOBILE  
 MITCHELL—OLDSMOBILE—PEERLESS**

ALSO

**GRAMM and FEDERAL TRUCKS**

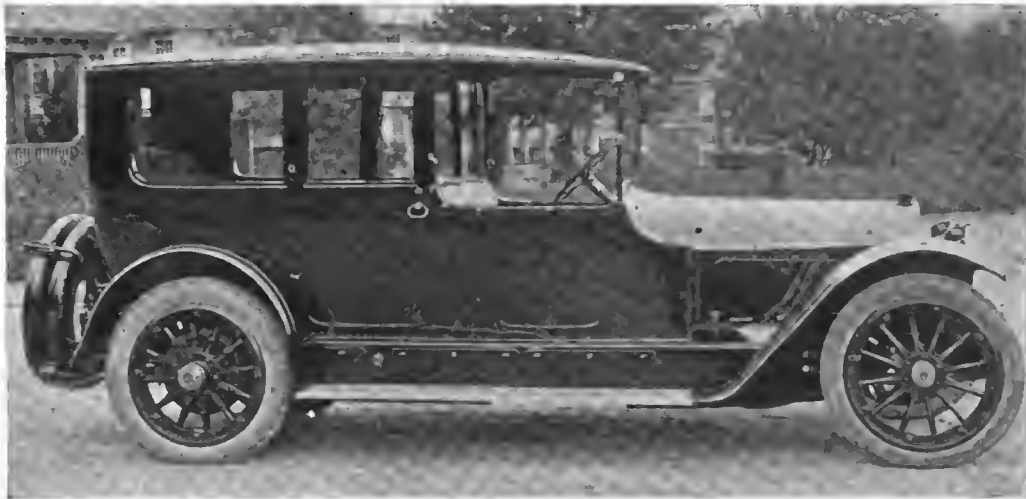
*Our book on Radiator History  
 and Efficiency tells why.*

**THE HARRISON MFG. CO., Inc.**  
 LOCKPORT, N. Y.



Please mention The Automobile when writing to Advertisers

# The LOCOMOBILE IS WALTHAM-EQUIPPED



The makers of the Locomobile are convinced that an automobile clock is a necessary part of every fine car.

The Waltham, having two mainsprings, an eight-day movement, and a winding indicator, and being adjusted to temperature and climate, and re-inforced against motor vibration, is the *only* accurate automobile timepiece made.

Why not put the name of *your* car among the twenty leaders of motordom equipped with the Waltham?

The Waltham is a regular feature of equipment in the following cars:

Brewster  
Cadillac  
Cole  
Crane  
Detroit-Electric  
Franklin  
Haynes  
Hudson  
Locomobile  
Lozier



The Waltham is a regular feature of equipment in the following cars:

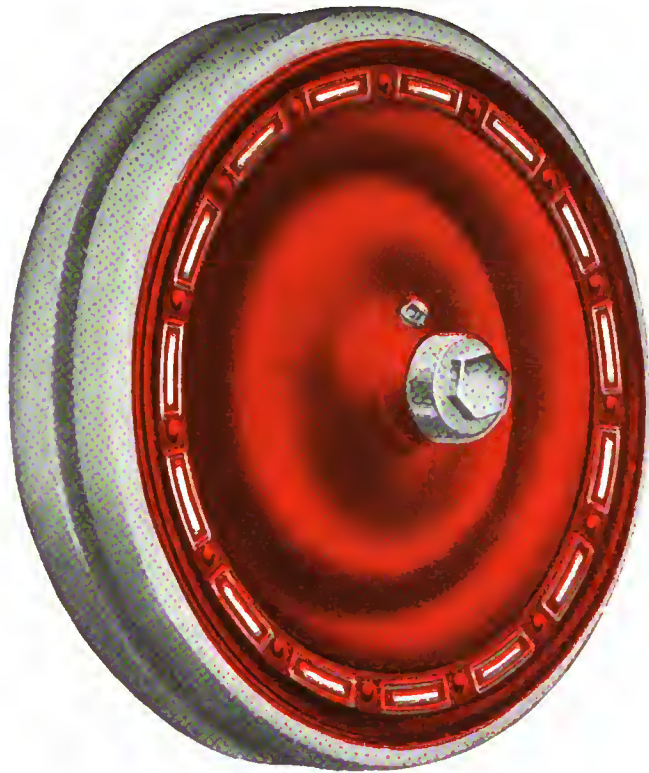
Marmon  
Mercer  
Owen Magnetic  
Packard  
Pierce-Arrow  
Rauch & Lang  
Rolls-Royce  
Simplex  
Stearns  
Winton

**WALTHAM WATCH COMPANY, WALTHAM, MASS.**



# Besco Steel Wheels

The Complete One Piece Wheel



Patented March 16, 1915



*have solved  
the Wheel Problem  
for motor trucks*

THE problem was to produce a wheel *lighter* and *stronger* than wood. BESCO Steel Wheels completely solve this problem. BESCO Steel Wheels do more—BESCO Wheels are not only lighter and stronger, but they get back to first principles in wheel construction—being solid and in one piece. The first wheels made were solid wood. They were strong but heavy, *very heavy*.

To get away from this difficulty — to lighten the wheel — part of it was cut away. The spoke wheel developed from this beginning. No other reason has ever been advanced in behalf of the spoke wheel.

Now we have disc wheels again which not only permit beauty in line and design but are superior to the spoke type both from engineering and foundry standpoints. The thin uniform section permits equal shrinkage and eliminates internal strains.

Remember, provision is made for applying skid chains to all types of BESCO Wheels. *Let us give you more BESCO facts.*

**CLARK EQUIPMENT COMPANY, Buchanan, Michigan**

*Successors to Buchanan Electric Steel Company*

Originators and Designers of  
Cast-Steel Disc Wheels for Motor Vehicles

Originators and Designers of  
Double-Disc Pressed-Steel Wheels

Please mention The Automobile when writing to Advertisers

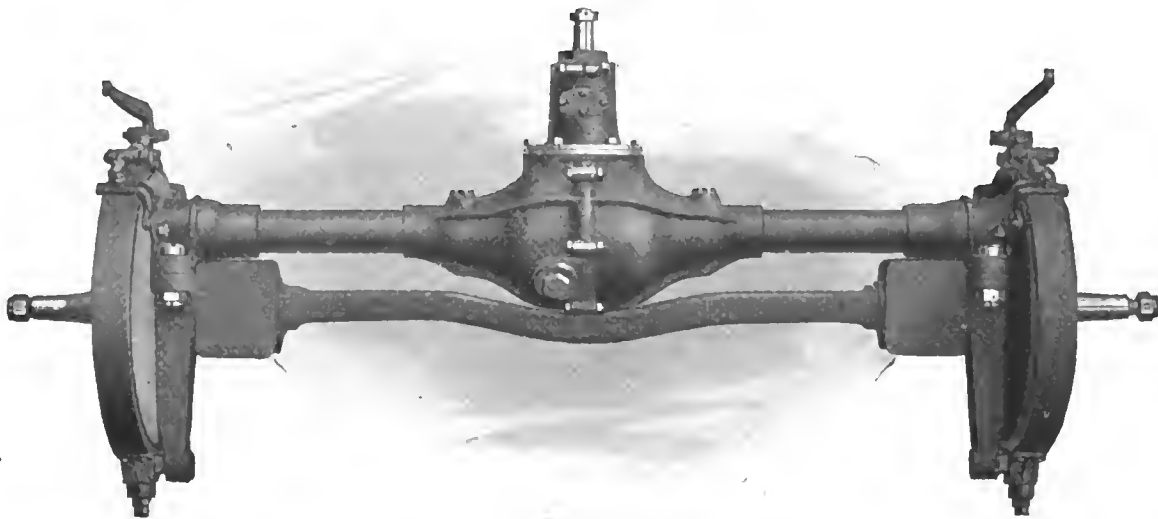
# Celfor

## Internal Gear Drive Axle

Made in the following sizes: 1000 lbs., 1-ton, 2-ton, 3-ton and 5-ton

Prompt deliveries on all models

Send for specifications and prices



1-Ton Size

**T**HIS is the latest model of the Celfor Axle which has created such a sensation in the truck industry during the two years of its existence. It has a solid forged load carrying member which is connected with the driving axle only at the extreme end. The driving axle can be quickly removed without disturbing the load carrying unit. This construction is found in all 1917 Celfor Axles, no matter what the capacity.

The Celfor is the axle to buy if you wish to combine lightness with strength, efficiency with economy.

*Send for the complete set of 12 Engineering Arguments*

**CLARK EQUIPMENT COMPANY, Buchanan, Michigan**

*Successors to Celfor Tool Company*

Please mention The Automobile when writing to Advertisers

# An Overwhelming Success at New York Show

*Demanded by Manufacturers—Pleaded for by Distributors and Dealers—Insisted on by Thousands of Car Owners*

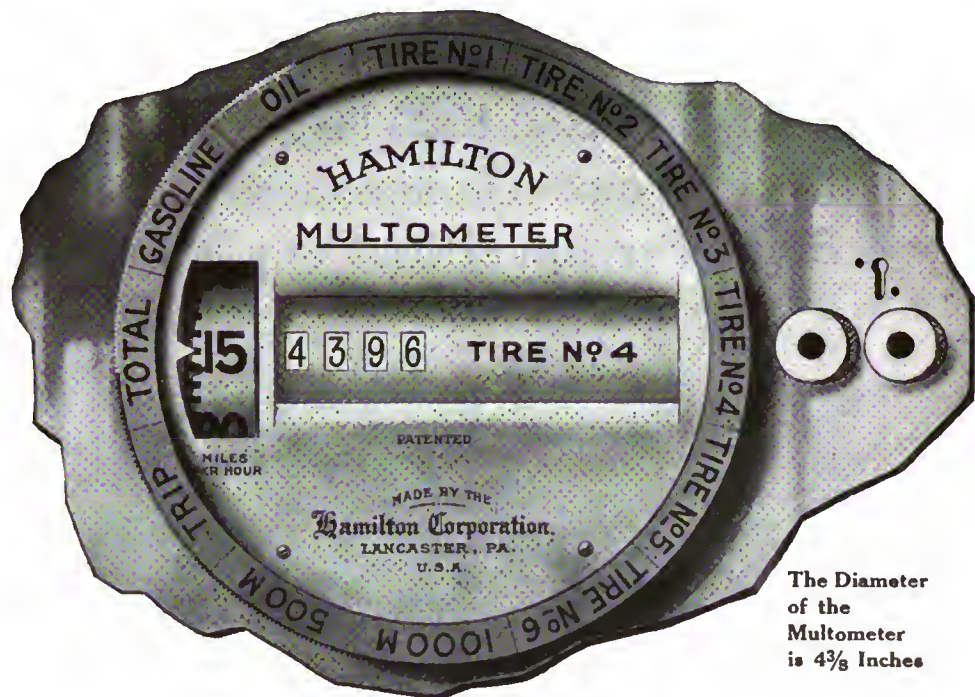
Protected by  
14 American  
and Many  
Foreign  
Patents

Price

**\$60**

F.O.B. Lancaster

Easily Saved in  
Tire Adjust-  
ments Alone



The Diameter  
of the  
Multimeter  
is  $4\frac{3}{8}$  Inches

## Hamilton Multimeter

**Literally Thousands Turned Away at the New York Show  
—We Could Not Accommodate Them All**

The success of the Hamilton Multimeter, announced at the New York show, was staggering. Literally thousands of dealers—car owners—engineers—manufacturers—eager to see this wonderful instrument, had to be turned away. We could not find room to accommodate them all.

The demand was overwhelming. In the first three days we could have contracted for many times the number we can possibly build this year. Telegraphic orders—orders by telephone—personal calls from dealers and owners from far away as the Pacific Coast and points in Canada were hourly occurrences.

We tried to accommodate every one but we couldn't take care of more than 25% of those who begged to come in just to see the Multimeter. And we had to turn down orders for thousands because we could not promise satisfactory delivery.

Hamilton Multimeter is the most tremendous success ever registered in automobile accessories. Never has there been such a huge demonstration of immediate approval—never has

a manufacturer been compelled to turn down orders by the thousand on the day his project was announced.

Hamilton Multimeter answers the question every manufacturer—distributor—dealer—car owner has been asking for years—"How can I keep an accurate record of my tire mileage, my fuel and oil consumption—and in addition, get a positive, accurate register of car speed and trip and season mileage?"

In Hamilton Multimeter these big important questions are answered and there is also an automatic warning of what attention is necessary to car at end of each 500 and 1000 miles of operation.

Purchasers literally fought their way into the exhibit of the Hamilton Multimeter—literally pleaded for delivery—offered every kind of inducement they could offer to persuade us to put them down for a definite date when we could satisfy their demand. And even the thousands who had to be turned away, went away enthusiastic over the Hamilton Multimeter.

Please mention The Automobile when writing to Advertisers

# Endorsed by Engineers, Designers, Dealers, Owners as the Most Marvelous Recording Device Ever Built for Motor Cars

The endorsement of Hamilton Multimeter is unanimous. Engineers marveled at the wonderful simplicity of the instrument which gives eleven mechanically operated readings and two manually operated readings, but put less strain on the single flexible driving shaft than the ordinary speed recording device which only registers speed, trip and season mileage.

The flexible shaft drive for the Hamilton Multimeter operated from either drive shaft or front wheel, turns only one odometer at a time, in addition to the speed indicating device—two-thirds the work done by the average speed recording instrument.

Designers of high grade accessories were absolutely astounded—they could not see, until demonstration had been made to them, how so many readings—such accuracy—such mechanical strength—could be encompassed in such small space.

After they had tried the Hamilton Multimeter themselves—studied every reading—witnessed every detail of operation—they said it was the most marvelous recording device ever made.

Dealers from all parts of the country—big distributors who demanded the Hamilton Multimeter by the thousand for immediate shipment, said: "It is the most wonderful recording device we have ever seen." "It is a device for which every one of our customers have been clamoring." "We had expected that if such a device were ever perfected, the price would be from two to three times greater than the price you ask for the Hamilton Multimeter." "What you have shown us has so greatly exceeded our expectations that we are absolutely staggered."

Motor car owners wired—wrote—telephoned—and called at our exhibit pleading for instruments for their cars.

The ease with which the Hamilton Multimeter can be installed in place of the present speed recording device—the fact that no change is necessary in the single, flexible cable drive—made instant appeal, and motor car owners added their unanimous endorsement to that of engineers, designers, distributors, dealers.

## We Cannot Possibly Build Enough Hamilton Multimeters To Anywhere Near Take Care of the Present Demand

Thousands upon thousands of owners, who want the Hamilton Multimeter must be disappointed this year. This is unavoidable. Straining every manufacturing effort—utilizing every inch of space of our greatly enlarged factory facilities—applying the most highly developed manufacturing efforts to production, we cannot possibly build enough Multimeters to anywhere near take care of the demand already evidenced.

We will not accept orders until after February 1st. Then, they will be filled in the order in which they are received.

Our distribution will be entirely through the highest grade dealers throughout the country.

At the present time we cannot promise Hamilton Multimeters for more than two manufacturers as regular equipment on the cars they build. We are going to divide production as equally as possible.

Manufacturers', dealers' and owners' orders sent to us on and after February 1st will be replied to immediately, and we will set, as closely as possible, the date on which we can make delivery of orders we accept. Do not be disappointed if we have to defer the filling of your order for several months. We are doing all that is humanly possible to do for you.

Every Hamilton Multimeter that is shipped away from factory will be covered by our perpetual guaranty of complete satisfaction which remains in force as long as the seal over the Multimeter itself is unbroken. That means that every Multimeter shipped from the factory will be inspected as thoroughly, as carefully, as completely, as the famous Hamilton Watches

You can afford to wait for the assurance of this high grade workmanship and quality.

## Are You the Man We Want as a Dealer?

We are raking the entire country with a fine tooth comb for high grade dealers. Our dealer representation must be the best that it is possible to build up.

We are laying out territory according to the distribution of quality cars—for it is on quality cars that the Hamilton Multimeter will find its greatest use.

We are arranging territory for dealers and

distributors so that they will get the full benefit of the tremendous demand that has already been registered.

Dealer applications must be considered carefully. It will take us time to decide.

Mail the coupon today. Fill out every question. No coupons will be considered which do not give us all the information we ask for.

Mail This Coupon Today

**Hamilton Corporation**  
Lancaster, Pa.  
Gentlemen: Please send immediately full details of your proposition to dealers. I am greatly interested and

could sell at least ..... Hamilton Multimeters a year.

Cars handled.....

Accessories handled.....

Territory desired.....

Bank references.....

Name .....

Street .....

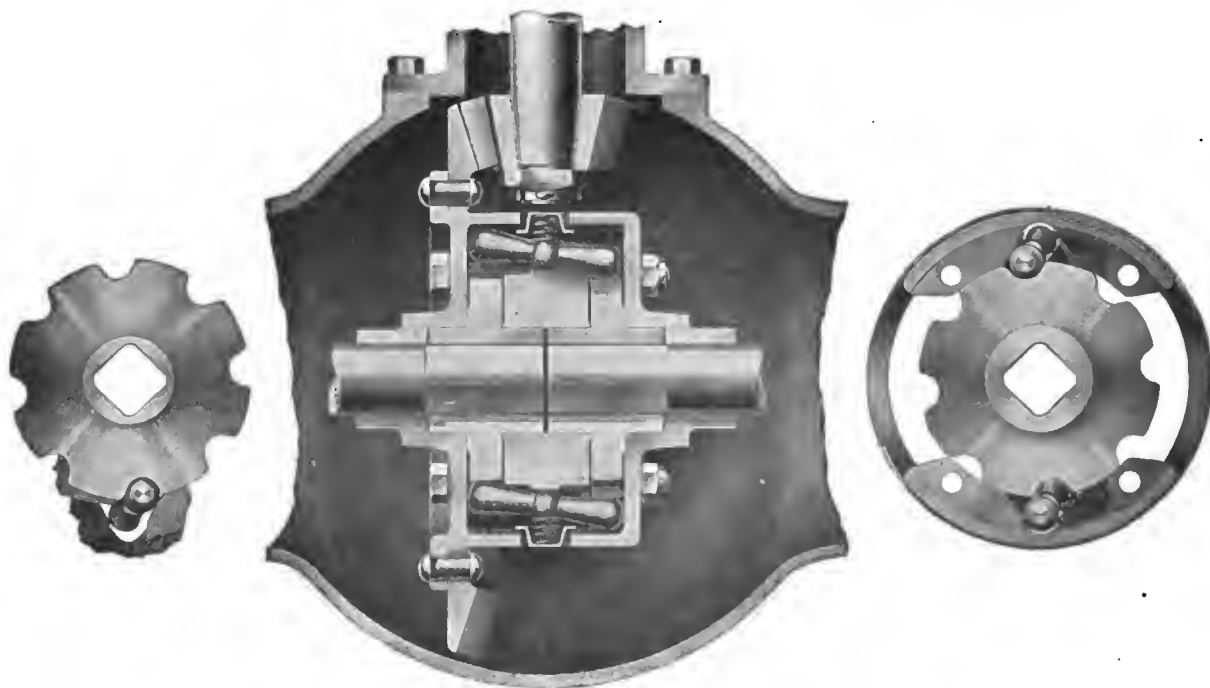
Town..... State.....

**The Hamilton Corporation, Lancaster, Pa., U.S.A.**

**Hamilton Multimeter,**  
a Recording Instrument  
of Scientific Accuracy

**Hamilton Watch Company**  
Makers of "The Railroad  
Time Keeper of America"

Please mention The Automobile when writing to Advertiser



**Begin Your Experimental Work for 1918  
Improvements by Trying**

# THE NEW PROCESS DIFFERENTIAL

**Gives Positive Traction and Requires No Change In  
Housing or Bearing Layout**

Send for a New Process Differential and put it into your testing car.

Drive it through mud, slush, snow, sand and over wet asphalt, and you will find a steady straight forward pull that keeps the car moving ahead *with all wheels in line.*

You will find the compensation perfect in turning corners, and on straightaway you will not have the

wheel spinning, sideways and skidding that always accompany an ordinary geared differential.

Our extensive plant permits us to meet the quantity requirements of any builder, and we stand ready to back this Gearless Differential with every reasonable performance guarantee.

Safety, confidence and comfort of owners in your 1918 cars demand that you start your investigations soon.

Licensed under patents of the  
Gearless Differential Company of Detroit, Mich.



## NEW PROCESS



# GEAR CORPORATION

SYRACUSE, N. Y.

133

# CHASE

## MOHAIR VELVET

“CHASE” MOHAIR VELVET IS NOT ONLY BEAUTIFUL in appearance, soft and pleasant to the touch, more comfortable to sit upon than a sheer, slippery surface; but—

IT IS THE BEST WEARING CAR UPHOLSTERY material you can possibly use. It is also the most sanitary, being thoroughly cleansible by the simplest methods.

IT ADDS TREMENDOUSLY TO A CAR'S SELLING VALUE, as its rich appearance attracts customers and the “Chase” 70-year reputation and absolute guarantee makes a lasting impression.

MADE UP ATTRACTIVELY IN THE RICHEST, SMARTEST colors and surface designs, it holds its good looks indefinitely and adds character and elegance to any car.

L. C. CHASE & CO.

NEW YORK

BOSTON  
DETROIT

CHICAGO

OTHER PRODUCTS OF OUR MILLS:  
Plush Motor Robes, Wool Robes, Steamer  
Rugs, Waxed Motor Cloths (for Tops) and  
Ship Covers, Rubber Cloths for Tops and  
Side Curtains, Felt and Rubber Radiator

# CHASE



## DREDNAUT Motor Topping

“CHASE” DREDNAUT MAKES UP INTO A BEAUTIFUL, RICH LOOKING job. For the Car Manufacturer or Top-Maker, it is easily the most attractive top material he could use. From every angle it presents a proposition that meets his requirements and fulfills his desires. It is made especially to do so.

L. C. CHASE & CO. FOR THIRTY YEARS HAVE SPECIALIZED IN TOPPING for the better grades of vehicles.

ESTABLISHED IN 1847, THEIR REPUTATION FOR FLAWLESS PRODUCTS, honestly represented, for contracts unswervingly lived up to, for earnest and successful efforts to produce the very finest materials possible of manufacture, is widely recognized and respected throughout the trade.

FOR THESE REASONS MORE TOPS ARE COVERED WITH “CHASE” products than with any other brand on the market.

L. C. CHASE & CO.  
BOSTON

NEW YORK

DETROIT

CHICAGO

OTHER PRODUCTS OF OUR MILLS:  
Plush Motor Robes, Wool Robes, Steamer  
Rugs, Wexford Motor Cloths for Tops and  
Sleeve Covers, Rubber Cloths for Tops and  
Side Curtains, Felt and Rubber Radiator  
Covers

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# CHASE

AMONG THE FIRST TO ENTER THE MOTOR CAR FIELD, L. C. Chase & Co. have developed the science of top-material making to an extraordinarily high degree.

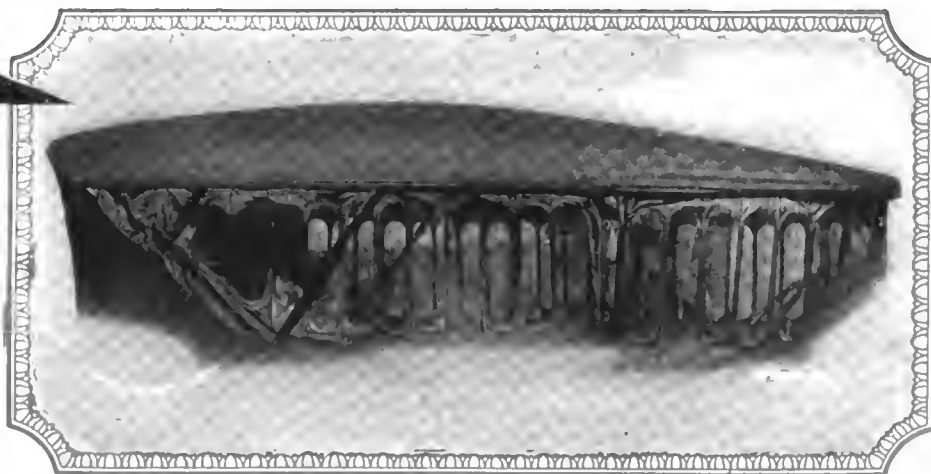
THE "CHASE" TRADEMARK IS AS STRONG A SELLING argument as a Dealer can have. It means (and has always meant) the highest quality producible.

CHASE DREDNAUT MOTOR TOPPING HAS BEHIND IT THE Guarantee of L. C. Chase & Co. It has within it exactly the sort of material best suited to withstand the wear and exposure to which motor car tops are subjected.

IT IS PREPARED FROM A FORMULA THAT IS THE RESULT of thirty years' actual experience in the manufacture of just this sort of goods.

IT IS UNUSUALLY STRONG AND SUBSTANTIAL, and of a weight and texture easiest for motorists to handle.

EXTREMELY SMART LOOKING, FINISHED IN A MANNER to add style and distinction to the finest car, it wears like iron, is full of life, and "comes back" after folding, retaining no creases to mar its appearance.



More vehicles are topped with "Chase" material than with any other brand.

OTHER PRODUCTS OF OUR MILLS:  
Plush Motor Robes, Wool Robes, Steamer  
Rugs, Wexford Motor Cloths for Tops and  
Slip Covers, Rubber Cloths for Tops and  
Side Curtains, Felt and Rubber Radiator  
Covers.

L·C·CHASE & CO·  
BOSTON

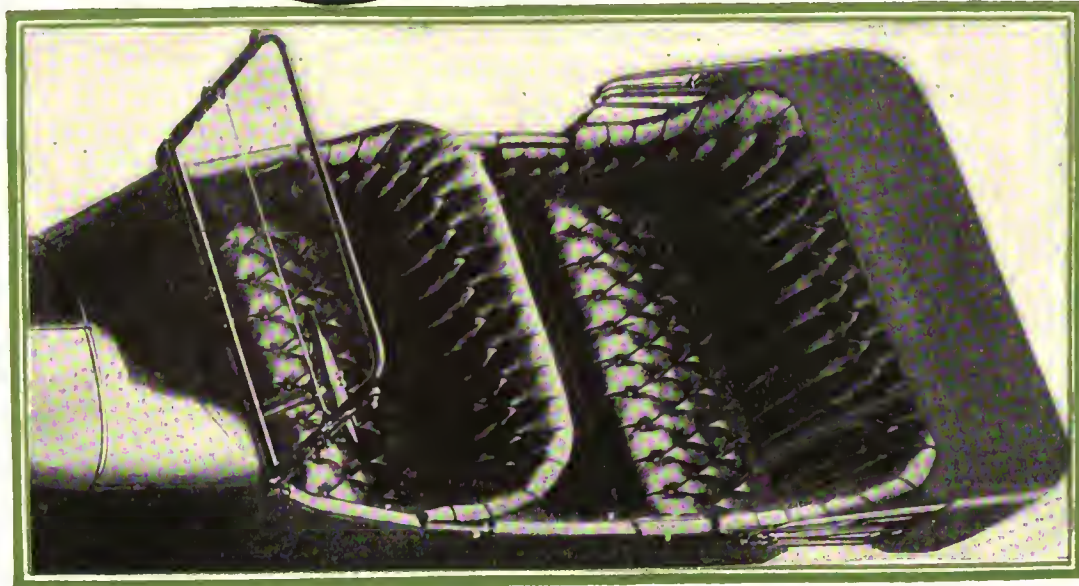
NEW YORK

DETROIT CHICAGO

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# CHASE



## Leatherwove

*"Tis like the hide in most respects  
In some respects 'tis better"*

"CHASE" LEATHERWOVE MAKES A BIG HIT with car buyers.

HANDSOME IN APPEARANCE, it is finished in the smartest styles and colors, giving the effect of the most expensive leathers.

ESPECIALLY MADE FOR THE PURPOSE, it is given extraordinary wearing qualities by the "Chase" method of manufacture, the result of experiments and study directed for years entirely toward the production of such a material.

LEATHERWOVE IS EASIER AND MANY TIMES MORE ECONOMICAL for a manufacturer to handle than any sort of leather, because of its uniform width, thickness and strength, its freedom from holes and irregularities, and the fact that it is made in just the proper proportions for cutting, so that no material is wasted. It gives you high quality at minimum cost.

WATER-PROOF, STAIN-PROOF, UNFADE-ABLE, easily cleaned with sponge and water, it is not affected by heat, cold, or exposure.

LEATHERWOVE GIVES SERVICE THAT WILL ENHANCE THE REPUTATION OF ANY CAR, and greatly increase its salability.



OTHER PRODUCTS OF OUR MILLS:  
Plush Motor Robes, Wool Robes, Steamer  
Rugs, Wexford Motor Cloths for Tops and  
Slip Covers, Rubber Cloths for Tops and  
Side Curtains, Felt and Rubber Radiator  
Covers.

L-C-CHASE & CO.  
BOSTON

NEW YORK

DETROIT

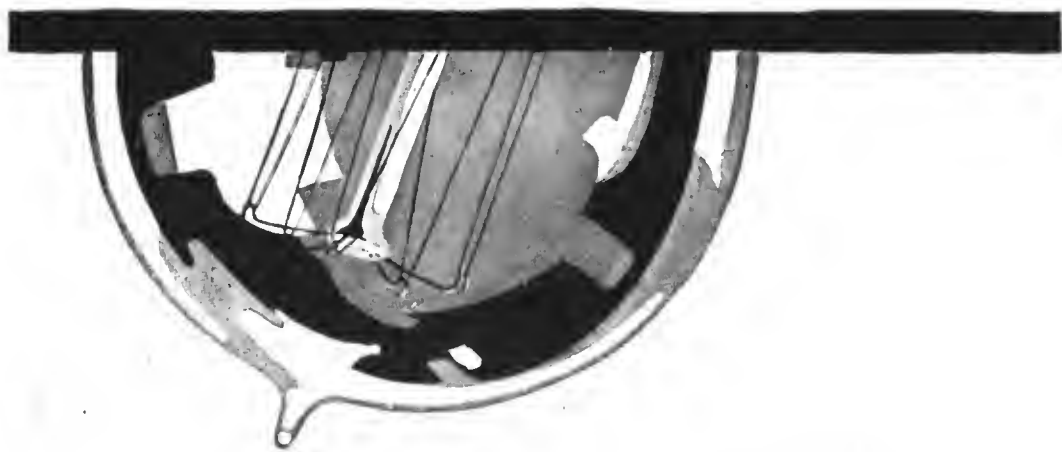
CHICAGO

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*"Not the name of a thing, but the mark of a service"*

No lamps can ever be marked  
MAZDA unless they embody MAZDA  
Service standards of excellence



— The Meaning of MAZDA —

MAZDA is the trademark of a world-wide service to certain lamp manufacturers. Its purpose is to collect and select scientific and practical information concerning progress and developments in the art of incandescent lamp manufacturing and to distribute this information to the companies entitled to receive this Service. MAZDA Service is centered in the Research Laboratories of the General Electric Company at Schenectady, New York.

The mark MAZDA can appear only on lamps which meet the standards of MAZDA Service. It is thus an assurance of quality. This trademark is the property of the General Electric Company.    ::    ::    ::    ::

 RESEARCH LABORATORIES OF  
GENERAL ELECTRIC COMPANY

4632

31 Extra Features  
8 New Body Styles  
Built by John W. Bate

*Mitchell*  
SIXES

\$1460 For 7-passenger Six—48 h. p.  
127-inch Wheelbase.

\$1150 For Mitchell Junior—40 h. p.  
120-inch Wheelbase Six.

Both Prices f. o. b. Racine

# A \$1,000,000 Story

We are spending one million dollars this year to tell men the Mitchell story.

It will be told all the year in magazines, weeklies, farm papers and newspapers. So every motor car buyer is bound to know and consider it.

Here is the gist of the story.

## John W. Bate Methods

The Mitchell car typifies scientific efficiency, as evolved and applied by a master.

The Mitchell factory, covering 45 acres, was built by John W. Bate. From the very beginning every step was designed for building this car economically.

Every machine—there are more than 2000—was designed for saving seconds.

Here we employ every method known for eliminating waste.

Since the Mitchell was standardized—since the present type was adopted—our factory cost has been cut in two. No other factory in the world, as per our best information, could build a like car at anywhere near our cost.

## Where Savings Go

These savings go largely into extra

value—into over-strength, added luxury and exclusive features.

For each important part the Mitchell standard today is 100 per cent over-strength. That is twice our 1914 standard. And that was considered extreme.

There are over 440 parts built of toughened steel. All parts which get a major strain are built of Chrome-Vanadium. And the vital parts are all built over-size.

The result seems to be a lifetime car. Even the springs—the weakest part usually—seem to be all-enduring. Not one Bate cantilever spring has ever yet been broken.

## Extreme Luxury

This year we start to build all Mitchell bodies, open and enclosed. They are

### TWO SIZES

**Mitchell**—a roomy, 7-passenger Six, with 127-inch wheelbase. A high-speed, economical, 48-horsepower motor. Disappearing extra seats and 31 extra features included.

Price \$1460, f. o. b. Racine.

**Mitchell Junior**—a 5-passenger Six with 120-inch wheelbase. A 40-horsepower motor— $\frac{1}{4}$ -inch smaller bore than larger Mitchell.

Price \$1150, f. o. b. Racine.

Also all styles of enclosed and convertible bodies. Also demountable tops.

built in a model body plant under Bate efficiency methods.

This new saving is all spent on extra luxury. This year we add 24 per cent to the cost of our finish, upholstery and trimming.

The result is heat-fixed finish, deep, lustrous and enduring. Also extra-grade leather and costly cushion springs. Also a finished touch to every body detail. You have never seen a car in the Mitchell class anywhere near so exquisite.

## 31 Extra Features

And the Mitchell this year embodies 31 extra features. That is, wanted features all of which most cars omit because of the added cost. Things like a power tire pump, for instance.

There are 31 of these extras in the Mitchell today, and nearly all are in Mitchells alone. They will cost us this year about \$4,000,000. And all are paid for out of factory savings, due to Bate efficiency methods.

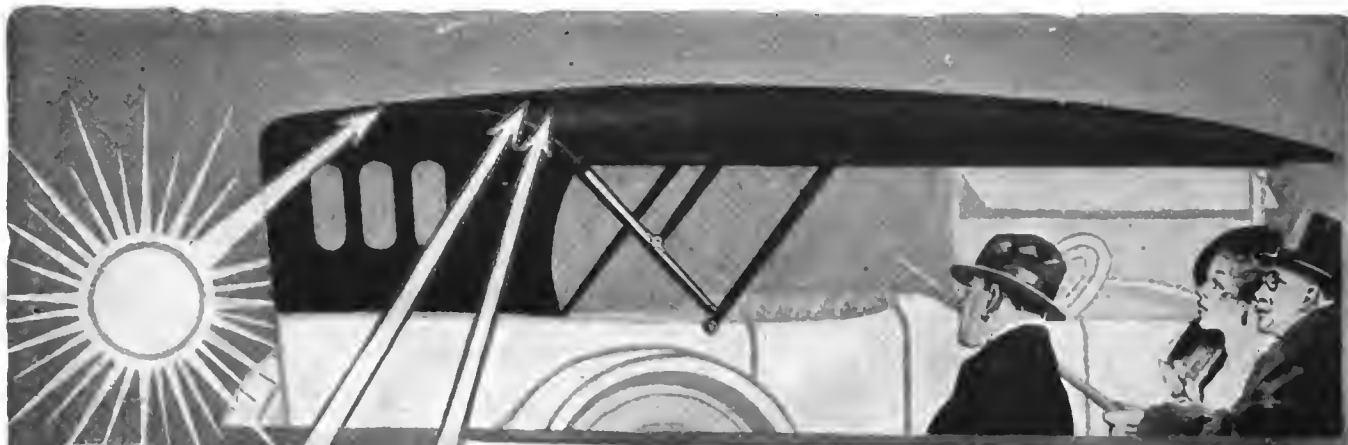
Such things, as you know, appeal to motor car buyers. And all motor car buyers will know them.

If you want such attractions in the car that you sell, look up the Mitchell advantages.

MITCHELL MOTORS COMPANY, Inc.  
Racine, Wis., U. S. A.



Please mention The Automobile when writing to Advertisers



HEAT

GREASE & OIL

COLD

## These Things Are Ruinous to Most Top Materials

—but the salesmen for the cars shown on this page can promise that neither sun, road oil, nor extremes in temperature will have the slightest effect on the tops their cars are equipped with. They use

# Genuine *Pantasote* Top Material

as Standard Equipment.

If the salesman is pinned down to the facts about Top Material, he should be in a position to show the customers the Pantasote label—not because his word may be doubted, but because cheaper materials are often unintentionally but incorrectly *termed* Pantasote.

AVOID MISREPRESENTATION — even though it be unintentional. Look for this label on tops represented as PANTASOTE.



Send for a copy of "What's What in Top Materials." It describes various materials used for covering tops.

THE PANTASOTE COMPANY 1709 Bowling Green Building New York City



PIERCE-ARROW



LOCOMOBILE



MARMON



MERCER



WHITE



HUDSON



CHALMERS



CHANDLER



PREMIER



REO 1917-SIX



PAIGE-STRATFORD



WESTCOTT



“Our Experience Has Been That

## VANADIUM SPRING STEEL

Renders Absolutely The Best Service  
Obtainable For Truck Springs.”

This unqualified endorsement of Vanadium steel truck springs by the Lippard-Stewart Motor Car Co. commands your careful, serious consideration.

They further report that, though the rear springs have to handle torque, breaking and driving strains, they so rarely have to replace springs that they “practically can forget the truck has springs after it leaves the factory.”

Lippard-Stewart’s experience with vanadium steel springs is typical.

# American Vanadium Company

New York

Pittsburgh

London



Copyrighted by Underwood & Underwood

**P**ULSING through the arteries of America's commercial highways—through the crowded narrow streets of the continent—in every corner of the world—you will find the highest grade motor vehicles equipped with SKF Ball Bearings.

This is so because American skill and Swedish steel have been combined to produce SKF "Quality and Service."



No matter whether it be in Europe or America, a preference for SKF is shown because of sheer superiority and quality.

**SKF BALL BEARING CO.**

**HARTFORD, CONN.**

# Save Shoe Leather!

## Conserve America's Dwindling Supply for Its Most Valuable Use!

The world faces a leather famine.

Tremendous war demand, diminished imports, and decreasing supply of cattle have combined to make leather of all grades scarce and precious.

Shoe manufacturers predict that without quick relief, 1917 leather shoes of good grades will retail at \$15.00 to \$20.00 a pair; already prices are up 50% to 100%. Sole leather has already sold for more than one dollar a pound.

The Government is supplying our Navy with shoes having soles made of a leather substitute, and is experimenting with the tanning of sharks' hides to help relieve the leather situation.

### How Motorists Can Help a Lot

The largest leather consuming industry is the shoe business. The second largest is the automobile business. The leather required to upholster the average touring car is enough to make the uppers of three dozen pairs of shoes. The grain leather used on expensive cars makes the best shoe leather. Its increasing scarcity has necessitated large use of split leather in shoe making. The latter is the grade used most in the automobile industry.

The motor-car buyers of America must decide which they will do without—leather in shoes or leather in automobiles.

**DU PONT FABRIKOID, MOTOR QUALITY**, offers the best solution of the problem.

This remarkably successful substitute for leather is already used for automobile upholstery more than all other materials combined. While not yet equal to grain leather it surpasses split leather for upholstery purposes.

Those automobile makers still using split leather admit, to us, that it is inferior to Motor Quality Fabrikoid, but hesitate to adopt it for fear some buyers may still think split leather (commonly advertised "genuine leather") is better. They will gladly adopt Motor Quality Fabrikoid, and thereby greatly conserve the dwindling supply of shoe leather, if you will help.

*When buying an automobile tell the dealer you prefer Du Pont Fabrikoid, Motor Quality upholstery. Many dealers in popular makes can and will tell you their cars are so upholstered. Dealers in other cars can get Fabrikoid upholstery if buyers ask for it.*

WRITE US FOR NAMES OF MAKERS NOW USING IT

**Du Pont Fabrikoid Company** WILMINGTON, DEL.  
TORONTO, ONT.

Works at Newburgh, N. Y., and Toronto, Ont.

*World's Largest Makers of Leather Substitutes*

#### Other ways in which FABRIKOID is relieving the leather market:

For upholstering furniture, buggies and boats.

For covering books (used by Government Printing Office and hundreds of America's largest binderies).

For making and lining suitcases, satchels, handbags, etc.

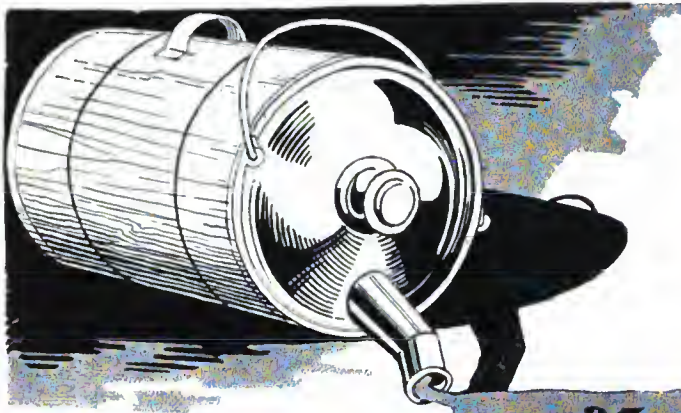
For gloves, gauntlets, sanitary hat sweats, boxes, toys, and novelties.

For sock linings, facings and tongues of shoes.

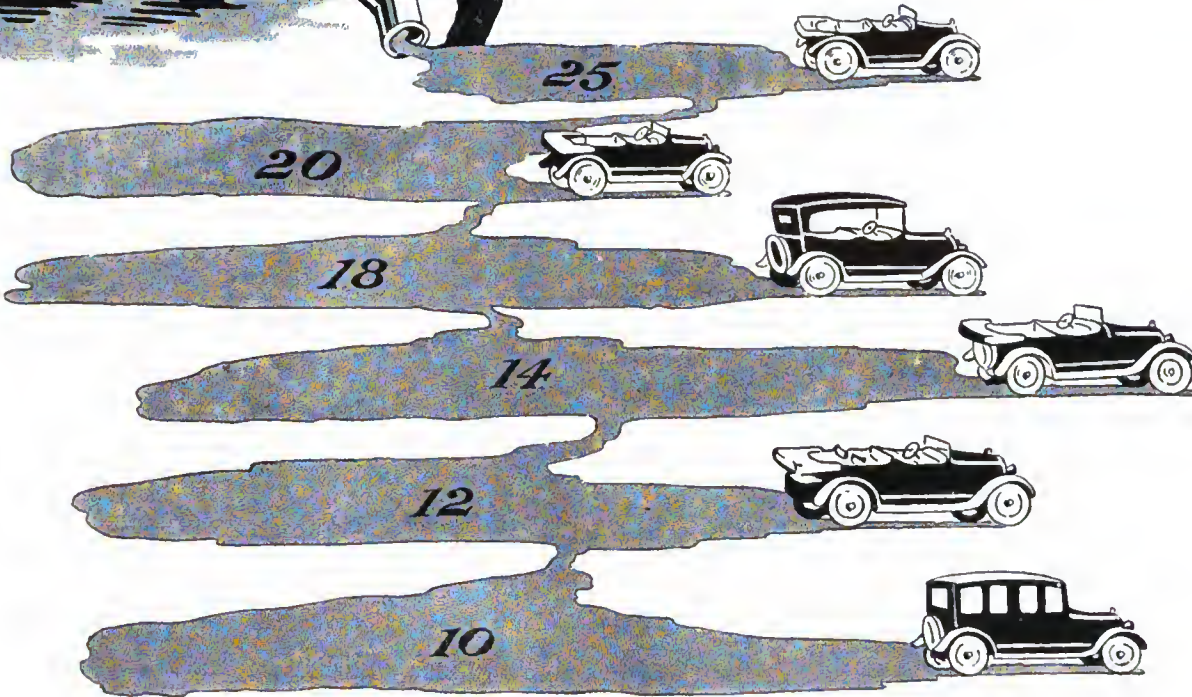
For bathing shoes and slippers.

If you manufacture any article using leather, ask us if we have a grade of Fabrikoid suitable for your work.





# TEXACO MOTOR OIL



## What Mileage Do You Get?

Of course, the mileage you obtain from a gallon of gasoline or quart of oil depends very largely upon the horse-power and weight of the car you drive. But not only does the car play an important part in the matter, so also do the gasoline and the lubricant—and they must bear their share of the responsibility for results.

This applies especially to the lubricant. You may use good gasoline in a good car and not obtain satisfactory mileage because you are not using the highest quality of motor oil obtainable.

In this connection you can do no better than pin your faith to Texaco Motor Oil. It is a most economical oil to use. It is a trouble saving oil.

Texaco Motor Oil is a southern oil with an asphaltic base. It is admitted by the most em-

inent authorities that the hydrocarbons composing the asphaltic base oils *cannot* form hard carbon. You who have had hard carbon cut and score piston rings, cylinder walls, and valves, know what this means.

Texaco Motor Oil stands up well in use because it gives a good seal to the piston and rings and prevents leakage of gasoline into the crank case.

Because of these facts Texaco Motor Oil enables a motor to run at its highest point of efficiency, enables the gasoline to deliver its maximum power, and as a result gives high mileage.

You can judge a motor oil very fairly by its color. Compare Texaco with others. Note its clear, clean color—the blue shade that appears when it is held to the light.

When you buy motor oil buy Texaco. The best way, the safest way, is in 1 or 5 gallon cans.



**THE TEXAS COMPANY**  
17 Battery Place  
New York



Please mention The Automobile when writing to Advertisers



# HESS-BRIGHT BALL BEARINGS



A. McMILLAN, President  
 H. G. McMILLAN, Vice Pres. & Gen'l. Mgr.  
 MANUFACTURERS  
 TRADE MARK  
 PRODUCTS

INDUSTRIAL EQUIPMENT COMPANY  
 INCORPORATED  
 MANUFACTURERS AND DISTRIBUTORS  
 223-225 MAIN STREET  
 SAN FRANCISCO, CAL.

J. W. WHITE, JR., SECRETARY  
 L. W. BRUNNITT, TREASURER

Philadelphia, Pa.

October 25, 1916.

Gentlemen:

Some time ago we developed a One Ton Worm Drive Axle and are now facing a demand for about forty of these per month for the next fiscal year.

We manufactured same using your HESS-BRIGHT BEARINGS on the worm and roller bearings on the worm wheel and axle, and also tried out some axles using all ball bearings throughout.

The operating results obtained by the all ball bearing axle are so favorable, both as to increased life and efficiency, that we have decided to use your HESS-BRIGHT BALL BEARINGS entirely on these axles.

Two of these axles are operating on transfer busses in Sacramento, California, in connection with the street railway system, and they reported the following service for sixteen days for two busses:

Miles traveled.....	4,300
Total miles per day for bus No. 1.....	185
" " " " " 2.....	125
Total number of passengers carried.....	4,360
Fuel.....	7,268
Average miles per gallon of distillate, including stoppage and three minute waitovers at the end of each twenty minute run, for the total mileage.....	16 1/2

The above axles were put under care which had been used for two years, and we therefore consider this record a little short of phenomenal.

We are also contracting for one hundred and twenty Two Ton Axles for the next fiscal year and will standardize on the HESS-BRIGHT BALL BEARINGS through-out.

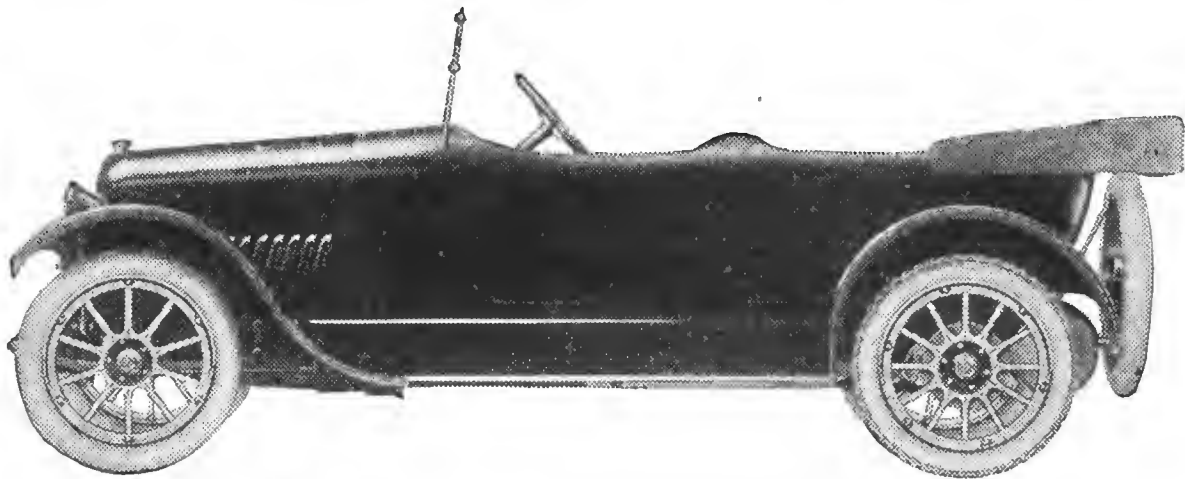
We believe that by incorporating the highest grade product into our axle with a superior design and workmanship we can build up an axle business on a more permanent and profitable basis.

Very truly yours,  
 INDUSTRIAL EQUIPMENT COMPANY  
 PER *J. W. White, Jr.*  
 SBY



THE HESS-BRIGHT MANUFACTURING CO.  
PHILADELPHIA

HESS-BRIGHT'S CONRAD PATENTS ARE THOROUGHLY ADJUDICATED



## “The Car of the Hour”

5-Passenger Touring

**\$985**

**Elgin Six**

4-Passenger Roadster

**\$985**

### Distinction and Comfort

The Elgin Six is the only car in its price class having the fashionable center cowl of the high-priced European models. Its beautiful yacht line design was established by a famous artist and gives the Elgin Six a style and distinction that set it apart from the monotonous design of the average car.

Elgin engineers have perfected an improved rear spring suspension, found only in the Elgin Six, which sets a new standard of motoring ease and comfort at high speeds, reducing shock and vibration to a point not surpassed in any car at any price.

The special construction of the Elgin velvet-acting clutch enables the Elgin Six to be started at high gear, under ordinary conditions, eliminating to a large degree the necessity of gear shifting, *thus removing the last barrier to the safe and easy handling of a motor car by women.*

### Endurance and Economy

The Elgin Six, now in its second triumphant year, has stood “The Acid Test” by winning perfect scores and highest honors in some of the most gruelling endurance and economy runs of the past year.

Three Elgin Sixes, on a hard two-days’ run under the auspices of the Chicago Motor Club, made perfect scores and averaged 25.6 miles to the gallon of gasoline.

The Elgin Six has just established a new record of 1,626 car-racking, stamina-testing miles, in 67½ hours, between Chicago and Miami, Fla.

Thirteen hours of this time was driven in a heavy rainstorm that made the roads slippery and dangerous, and in some places so deep and

heavy with mud that the average car could not negotiate them at all.

The route included the steep, rocky mountain grades of Kentucky and Tennessee, the heavy sands of Georgia, and the slimy, treacherous swamp roads of Florida.

An Elgin Six touring car won a race against a fast express train through the wilds of Minnesota and Dakota, over roads that in some places were little better than a mere rocky trail, covering 552 miles without mechanical adjustment and without a single stop of the motor.

Many other remarkable Elgin performances have firmly established the Elgin as a *mechanical masterpiece*, and the champion for long sustained speed, endurance and economy.

**IMPORTANT TO DEALERS**—The completion of our big, modern, daylight Plant No. 2 has so increased our production that we are now entering new territory. Yours may be open. Better wire us for application blank and full particulars of 1917 best money-making proposition for dealers.

**Elgin Motor Car Corporation, Chicago, U. S. A.**

# FAFNIR

## BALL BEARINGS

### ALLIES OF YOUR ENGINE



You drive your car against road resistance, and judge its "pep" by its fight against that.

But never forget that before your car can overcome the resistance of the road, it must overcome the resistance in its own bearings.

Only the power that survives this struggle --- this internal fight with friction --- can speed you on.

What a gain, then, is scored over road-resistance by even a small reduction in bearing resistance!

FAFNIR BALL BEARINGS will effect this gain for you, and it's positive that the results will be

Lower gasoline costs due to power waste saved.

Lower up-keep costs due to wear and repairs saved.

Specify FAFNIR BALL BEARINGS as allies to your engine and exponents of economy.

## The Fafnir Bearing Company

Conrad Patent Licensee

Detroit Office :  
752 David Whitney Bldg.

Main Office and Factory :  
New Britain Conn.

Chicago Office :  
39 So. Clinton St.

# A R A C E



*That  
Never  
Ends*

**D**AY by day—year after year—unceasingly it goes on. No cheering crowds, no public acclaim, no press publicity, but modestly and unheralded this race continues. Yet, it means more to the automobile world than any other race ever staged, for its purpose is to improve motoring for every motorist—everywhere.

It means higher mileage, greater comfort, keener motoring pleasure, and lower upkeep cost per mile for every Republic equipped car. This never-ending race,

## BRAINS vs. ROAD TESTS

is responsible for Republic supremacy, and among other improvements for discovery of the Prodim Process of Compounding Rubber which has scored such a triumph in the tire world.

Never before has such remarkable rubber been used in tire manufacture and yet we are not satisfied. If it can be improved we will find the way, for the race still goes on.

Republic test cars are running every day, over every kind of road, in all kinds of weather. Every item, condition, and performance of every tire and tube is carefully tabulated and the reports govern every operation in the manufacture of

## REPUBLIC TIRES

Manufactured by

**THE REPUBLIC RUBBER COMPANY**  
YOUNGSTOWN, OHIO

*Branches and Agents in All Principal Cities*

**TO TIRE DEALERS**

This never-ending determination to excel means bigger opportunities for the dealer as well as satisfaction for the user.

Republic Tires and Black-Line Red Inner Tubes will establish you firmly and surely in the good opinion of your customers, and every tire sells three more.

*Write for Dealer's Proposition*





# WOODWORTH

## Spring Cover and Lubricator

SAVE YOUR SPRINGS AT LITTLE COST by using a Woodworth Spring Cover.

IN A FEW MINUTES, WITH LITTLE TROUBLE, you can lace it over your springs and save them from rust, dust, and breakage. The result is an easy-riding, constantly lubricated spring. The improvement in the riding of your car is remarkable. All squeaks are eliminated and the car rides as though equipped with a set of shock absorbers.

RUSTY, NEGLECTED SPRINGS ARE LIABLE TO BREAK, but even before then they are of little service as vibration-preventers.

A WOODWORTH SPRING COVER protects the spring, cuts rust already accumulated, and prevents the accumulation of more. It keeps the spring free from dust and mud, well oiled, and noiseless.

LOW IN PRICE, SIMPLY MADE OF STRONG LEATHER lined with felt wicking, it is a spring-saver and a trouble-saver, preserving the comfortable riding qualities of your car and saving you the expense of spring renewals.

Once saturated with oil, it will not require renewing for an entire year.

Made to fit all makes of cars. Dealers are handling these spring covers with profit and satisfaction. Customers appreciate being advised of this easy method of spring protection. Write for generous terms.

### PRICES

Sizes	Genuine Imitation	
	Leather	Leather
12 in. or less.....	\$0.65	\$0.30
12-14 in.....	.90	.40
14-16 in.....	1.10	.50
16-18 in.....	1.30	.60
18-20 in.....	1.50	.70
20-22 in.....	1.70	.80
22-24 in.....	1.90	.90
Over 24 in.....	2.00	1.00

## WOODWORTH MANUFACTURING CORPORATION

NIAGARA FALLS, NEW YORK

CANADIAN FACTORY, NIAGARA FALLS, ONTARIO

**1/3  
LIGHTER  
2/3  
STRONGER**



## THE FOUNDATION OF STEEL

which cuts the weight while doubling the strength

This steel skeleton (fully protected by the Babcock Patents) is found exclusively in Babcock Commercial Bodies. It is the answer to the universal quest for lightness without sacrifice of strength. It is the explanation of the superior rigidity and durability of these bodies in spite of the fact that they are 40 per cent lighter than any others of equal size.

# BABCOCK

## COMMERCIAL BODIES

The finest and toughest open-hearth angle steel is fitted and bolted so securely to sill, cross-sill and upright (all of selected native hard woods) as to produce in reality as well as appearance one homogeneous material wonderfully strong and light.

The remarkable saving of weight which results from this blending of steel and wood, while retaining the desirable qualities of both materials, is only one of the many features which make Babcock Bodies superior to all others. All irons are bolted or riveted and wherever strain occurs steel plates are placed between the bolt heads and the wood. There is steel reinforcement at all points exposed to wear or strain, but that reinforcement is not merely a brace or patch; it is essentially one with the rest of the body.

Babcock Bodies are manufactured in thousand lots in a plant comprising over 12 acres of floor space and affording every facility for economy in production, thus enabling us to offer a body for every need at remarkably reasonable prices.

**Body Buyers**—Demand this absolutely unequalled combination of Babcock Quality and Economy.

**To Agents for Ford and all other cars, one-ton trucks and various Ford Extensions:**

You cannot afford to ignore the popular demand for Babcock Quality and Economy.

Let us show you the advantage in meeting this intelligent discrimination.

*We Solicit All Inquiries*

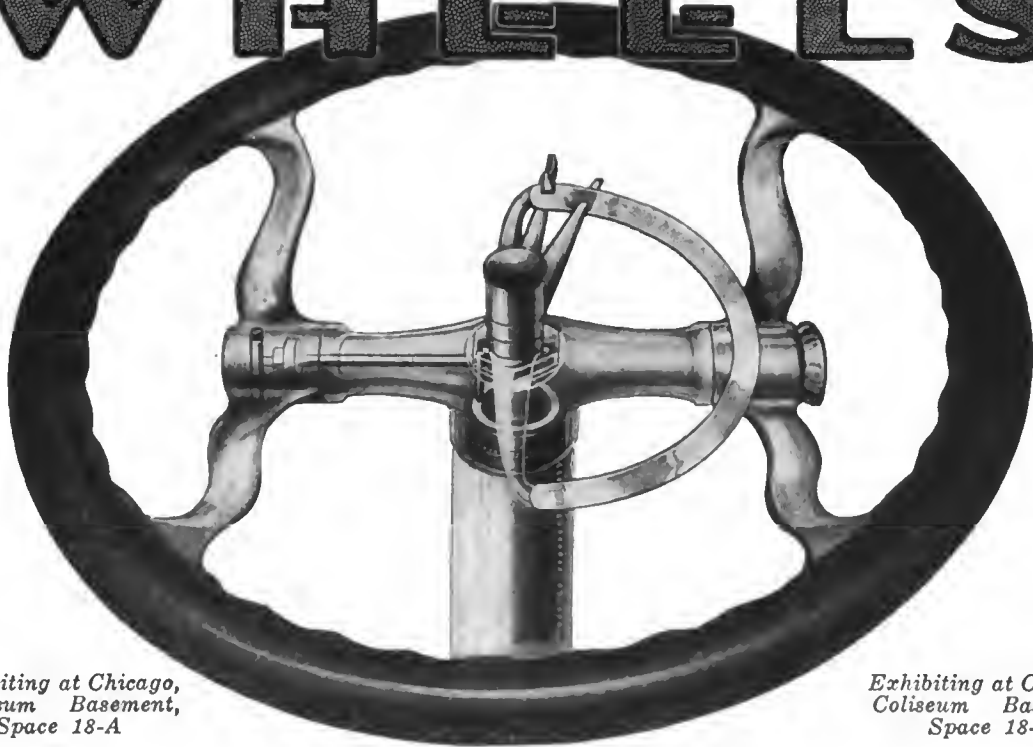
**M. H. BABCOCK COMPANY**  
 WATER TOWN,                      FOUNDED 1845                      NEW YORK.

Please mention The Automobile when writing to Advertisers

# POVASCO

## STEERING

# WHEELS



*Exhibiting at Chicago,  
Coliseum Basement,  
Space 18-A*

*Exhibiting at Chicago,  
Coliseum Basement,  
Space 18-A*

## The Ultimate in Steering Wheel Appearance, Durability and Usefulness

**T**HE molded composition of POVASCO WHEELS gives an almost everlasting durability, and enables the owner to keep the wheel at a high, brilliant finish that is itself an asset to a car.

POVASCO UTILITY, however, is best represented by the hand-heating and tilting features, which are made in separate models or combined in POVASCO De Luxe, a phantom illustration of which we present above.

For the warm hand feature a connection is made by an armored cable running from the battery through a rubber bushing inserted in the outside casing of the steering post under the hood. It passes up the interior of the outside casing of the steering post, through a molded commutator connection which takes the place of the graphite bushing at the top of the steering post. The current is conducted to the steering wheel itself through brush connections which touch this commutator. These details can be per-

ceived in the illustration. A touch of the push button turns the heat off or on.

The simplicity of the Tilting Feature is obvious. The knob at the right hand of the steering wheel spider is pulled out, the wheel tilted forward or back, as the need indicates, and parallel to the steering column. The knob is released, springs back and your wheel is locked in position.

Its design is simplicity itself, isn't it? And even the layman can see that its principle is as sound as it is simple.

POVASCO WHEELS therefore present to alert, intelligent distributors an unexampled opportunity to get into a profitable, growing, REPEATING business with the investment of little capital.

Write for Beautiful Catalog Now—and  
ask for our Distributor's Proposition

**POUVAILSMITH CORPORATION**  
POUGHKEEPSIE : : : : NEW YORK

*"Built  
and Sold  
for . . .  
Everlasting  
Service."*

# D-E

## WORM DRIVE



## MOTOR TRUCKS

### The Greatest Truck Proposition in America!

**¾-Ton \$975. 1-Ton \$1250. 1½-Ton \$1500. 2½-Ton \$2000**

Investigate the proposition in detail; go over their remarkable specifications carefully—and the conviction will be forced home on you that nowhere in the United States is there a line of trucks of such dominating superiority for the money, or trucks that offer greater selling possibilities.

You'll find, first of all, the huskiest frames you ever saw in trucks of D-E sizes—sturdy pressed steel, fabricated in unusually large sizes. But wait till you see the MASSIVE WORM-DRIVE rear axles! And the MOTORS! They are CONTINENTALS—except in the ¾-Ton—typical TRUCK motors. And so on, from radiator to hub caps, are specifications that

#### COMING!

On April 1st we shall begin deliveries of our new 2½-Ton Trucks. The price—\$2000—makes it absolutely the greatest value on the market. WORM-DRIVE—same as the rest of the D-E line. It's a marvel!

sound incredible at these prices! No wonder dealers are so enthusiastic, for they are the easiest and fastest-selling Trucks ever produced. Write or wire us for complete specifications and dealer proposition.

#### GENERAL SALES OFFICES

1457 Broadway, New York

*P. K. Hexter, Sales Manager*

#### DAY-ELDER MOTORS CORP.

Manufacturers of

D-E WORM-DRIVE MOTOR TRUCKS

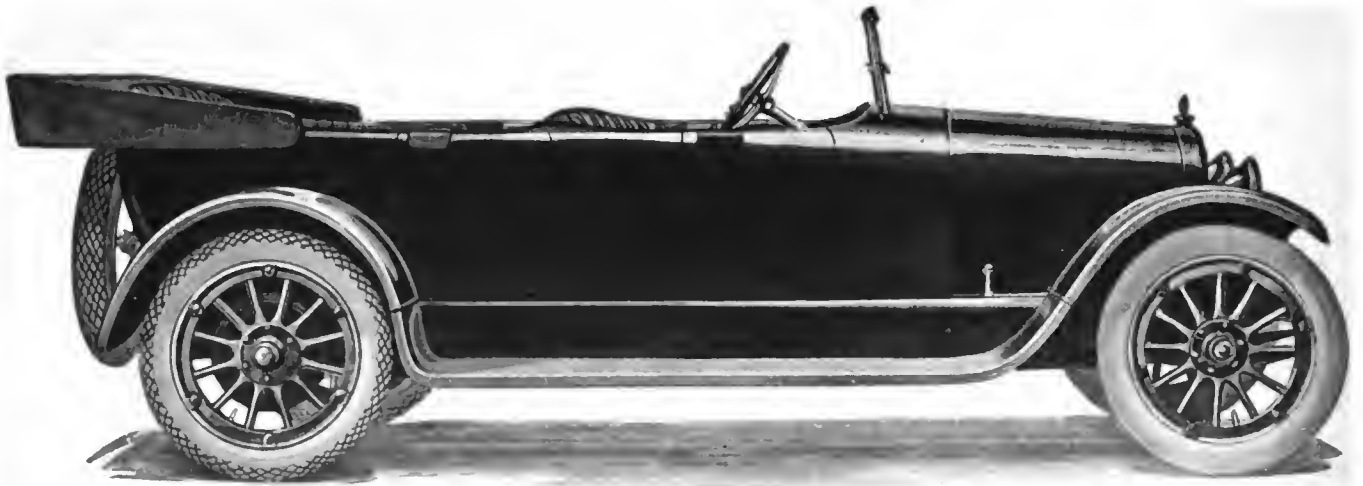
Newark, New Jersey, U. S. A.



D-E Worm Drive 1-Ton Truck with Stake Body

Please mention The Automobile when writing to Advertisers

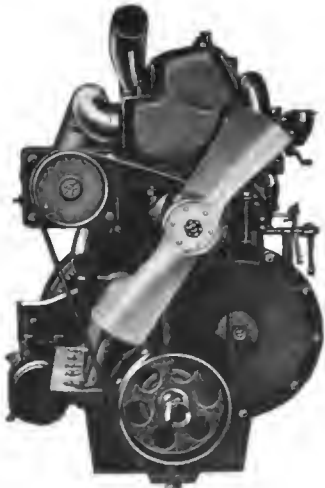




## A Combination of Construction Features Unequaled at Double the Price

With the Monroe Car you get a 4-cylinder motor, valve-in-head type, small, powerful, highly refined,—equally efficient and smooth-running at 3 miles an hour and at 60.

You get a pressure oiling system which adjusts the lubrication of the cylinders to the amount of power being generated, preventing over and under lubrication.



# The Monroe

An M & S differential securing equal traction, except when turning and preventing skidding, spinning and sticking.

Cross compound cantilever springs and deep frame construction, giving exceptionally easy riding qualities.

The Brush patented chassis structure—in which the frame is conformed to the shape of the body in a way to secure extra rigidity and stability and at the same time permitting lighter frame and body construction.

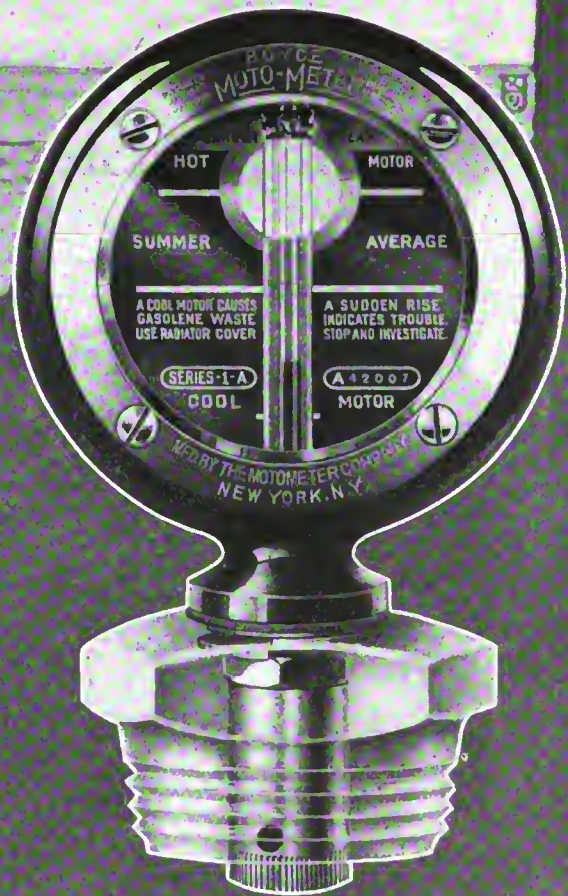
The Monroe Car is an extremely light weight car for the power it generates and its carrying capacity. Every high grade standard unit necessary for efficiency has been installed in the Monroe.

Where else can you get such a combination of up-to-date features and good construction for \$985?

**THE MONROE MOTOR COMPANY**  
PONTIAC MICHIGAN

U

# BOYCE MOTOMETER



THE NEW UNITED STATES SEAPLANES are equipped with Boyce Moto-Meters.

AEROPLANES IN THE GREAT EUROPEAN WAR are equipped with Boyce Moto-Meters.

EVERY AEROPLANE FLYING AT MINEOLA is equipped with a Boyce Moto-Meter.

EVERY RACING MOTOR CAR DRIVER insists on having a Boyce Moto-Meter on his car.

The fact that 53 of our leading motor car manufacturers have also made the Boyce Moto-Meter standard equipment on their cars is ample proof that they also consider this asset too valuable to be neglected.

Make sure this summer that YOUR car has a Boyce Moto-Meter.

THE MOTO-METER COMPANY, Inc.  
15 Wilbur Avenue  
Long Island City, N. Y.



Please mention The Automobile when writing to Advertisers

# Departments of Your Plant

## Rod Assemblies



Many of the largest and most efficient manufacturing organizations in the automobile industry recognize our ability to make these assemblies to better advantage than they could do it themselves.

Their combined requirements give the steady volume of business that makes for quality, service and low costs.

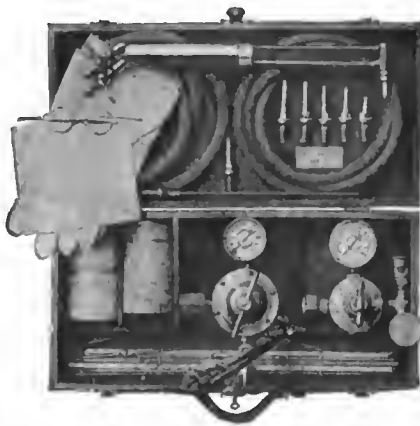
Make us your rod assembly department.

## Michigan Electric Welding Plant

Hart Avenue

Detroit, Mich.

## Welding Outfits



This case contains everything needed for acetylene welding, except the tanks of gas.

For general welding or repairs, in the

automobile plant or garage, this equipment is ideally suited. Write for folder.

**Metals Welding Plant**  
Perkins Ave. Cleveland, O.

## Spring Shackle Bolts

What steel?

What heat treatment?

What type of lubrication?

Our engineers can give you the benefit of a wide experience on all these questions of design, and our manufacturing department can produce the bolt no matter what type you adopt.

Consult us as your spring bolt department.



**The Steel Products Co.**  
Clarkwood Rd. Cleveland, O.

*Address all communications to individual plants as above.*



# The Steel Products Co.

Please mention The Automobile when writing to Advertisers

OUR displays at the National Automobile Shows best reflect the conscientious manufacture of our Giant line of Electrical Devices.

Our wide range of equipment is an assurance of the most comprehensive ignition service available at our branch houses throughout the country.

*DIXIE* 20<sup>TH</sup> CENTURY  
MAGNETO

*Lighting and Starting  
Systems*

The Plug with the  
Green Jacket  
**AMMETERS**

Splitdorf Electrical Co.

Newark, New Jersey.



Please mention The Automobile when writing to Advertisers

# Why have 150 Car Builders adopted the ECLIPSE-BENDIX DRIVE as Standard Equipment



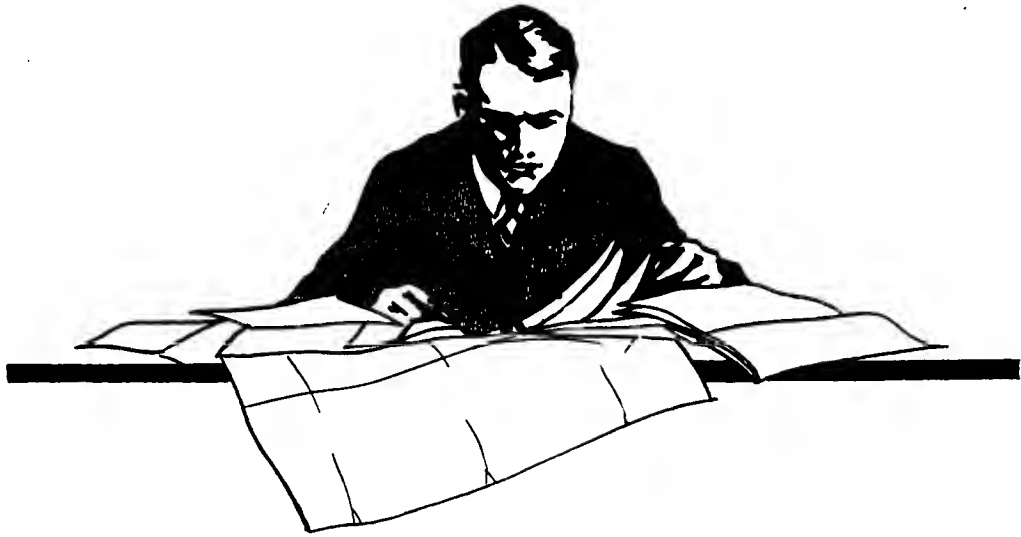
- The following makes of cars are using the Eclipse-Bendix Drive as regular equipment:
- |            |              |
|------------|--------------|
| Abbott     | Enger        |
| Detroit    | Erle         |
| Allen      | Federal      |
| All Steel  | Fosterla     |
| Alter      | Garford      |
| American   | Geueva       |
| Ames       | Gerlinger    |
| Anderson   | Glide        |
| Apperson   | Ghent        |
| Auburn     | G.M. Truck   |
| Austin     | Gramm-       |
| Bell       | Bernstein    |
| Biddle     | Grant        |
| Blmel      | Gray-Dort    |
| Bour-Davis | Great        |
| Briscoe    | Eagle        |
| Ben Hur    | G. V. Truck  |
| Canadian   | Hal          |
| Overland   | Halladay     |
| Canadian   | Harroun      |
| Regal      | Hassler      |
| Case       | Haynes       |
| Chalmers   | Heny         |
| Chandler   | Hupmobile    |
| Chevrolet  | Imperial     |
| Cocoy      | Inter-       |
| Cole       | national     |
| Collier    | interstate   |
| Truck      | Jackson      |
| Columbia   | Jeffery      |
| Common-    | Quad         |
| wealth     | Jones        |
| Crawford   | Jordan       |
| Crow-      | Kelly-       |
| Elkhart    | Springfield  |
| Cummings   | Keruo        |
| Daniela    | Truck        |
| Davla      | King         |
| Fennu      | Kissel       |
| Detroit    | Kilne        |
| Hile       | Lenox        |
| Dixie      | Lesclna      |
| Dorris     | Lexington    |
| Dort       | Liberty      |
| Drexel     | Liyett-      |
| Drynmound  | Stewart      |
| Duplex     | Little Giant |
| Power      | Lozier Bros. |
| Elcar      | Madison      |
| Elgin Six  | Marion-      |
| Emerson    | Handley      |
| Empire     | McFarlan     |

- Because the starting efficiency is much greater than with any other system.
  - Because the meshing of the gears is absolutely automatic. At the time of starting, the Drive gear automatically screws along the Drive shaft and meshes with the flywheel gear, and then cranks.
  - Because the demeshing after starting is absolutely automatic. After the engine is started the flywheel gear turns faster than the Drive gear and screws the latter back on the Drive shaft until it is out of mesh.
  - Because cast iron teeth without any chamfer not only make a great saving in cost, but are actually superior, being the simplest, most efficient and durable construction possible. The teeth are cut in the flywheel which is a natural gear blank. Stripping of these teeth by accidental starting when the engine is running is impossible, because of the automatic demeshing action.
  - Because back-fires are automatically protected by the shock absorbing spring Drive.
  - Because there is no over-running clutch to stick or slip.
  - Because there is no resistance or two-point switch to burn out.
  - Because there are no shifting levers and pedals, with their complications.
  - Because it is simpler and has fewer parts than any other starting system.
  - Because it eliminates chains, which stretch, break and get noisy.
  - Because it minimizes gear noise in cranking by driving through a spring.
  - Because it is absolutely silent when the engine is running, being absolutely disconnected.
  - Because it permits of using a simple, small generator for constant running.
  - Because it permits of cranking the engine with the most efficient of all starters—a separate electric starting motor—and also more evenly.
  - Because it makes the two-unit type of starting and lighting system superior to any other and the most popular of all.
  - Because it requires the minimum of care and attention during the life of car.
  - Because it is regularly supplied and used as standard equipment with the following starting and lighting systems, on over 125 different makes of motor cars; and also on a large number of marine and aeroplane motors.
- |                |                |                 |
|----------------|----------------|-----------------|
| A-B-C          | Gray & Davis   | Robbins & Myers |
| Allis-Chalmers | John O. Heinze | Roth Bros.      |
| Auto-Lite      | Kemco          | Splitdorf       |
| Delco          | Leece-Neville  | Wagner          |
| Detroit        | North East     | Ward-Leonard    |
| Disco          | North Western  | Westinghouse    |
| Dyneto         | Remy           |                 |

- The following makes of cars are using the Eclipse-Bendix Drive as regular equipment:
- |            |            |
|------------|------------|
| Meteor     | Regal      |
| M. H. C.   | Remington  |
| Mitchell   | Republic   |
| Mollne-    | Riddle     |
| Knigh      | Roamer     |
| Monarch    | Ross       |
| Monlor     | Rush       |
| Monroe     | Saxon      |
| Moon       | Scripps-   |
| Murray     | Booth      |
| Napoleon   | Service    |
| Nash       | S. G. V.   |
| National   | Singer     |
| Nelson     | South Bend |
| LeMoon     | S & S      |
| Norwalk    | Stearns    |
| Nusco      | States     |
| Oakland    | Standard   |
| Ogren      | Stegeman   |
| Oldsmobile | Sterling   |
| Overland   | Stewart    |
| Owen       | Sun        |
| Schoeneck  | Thomas     |
| Palze      | Touraine   |
| Partin     | Trumbull   |
| Palmer     | Union      |
| Paterson   | U. S.      |
| Pathfinder | Peerless   |
| Peerless   | Velle      |
| Penny      | Vnican     |
| Pilgrim    | Westcott   |
| Pilliod    | White      |
| Pilot      | Whitys-    |
| Premier    | Knigh      |
| Princess   | Winton     |
| Pullman    | Wolverine  |
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Sole Agents: BRANDENBURG & CO., NEW YORK, 57th and Broadway; DETROIT, Dime Bank Building; CHICAGO, 1112 Michigan Avenue



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*When you consider that  
The WYMAN-GORDON GUARANTEE  
with all the care and skill that it represents*

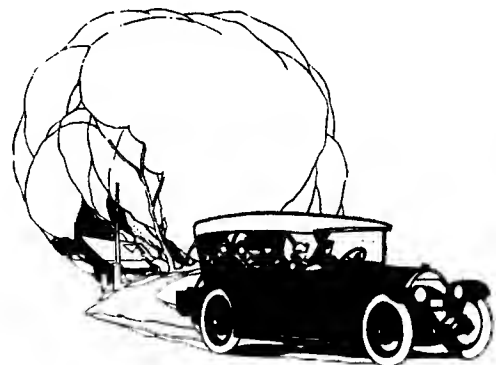
is further strengthened by personal study and correct solution of the individual problem presented, there can be small doubt that the resultant forgings are not only the most serviceable but also the most economical that could be procured.

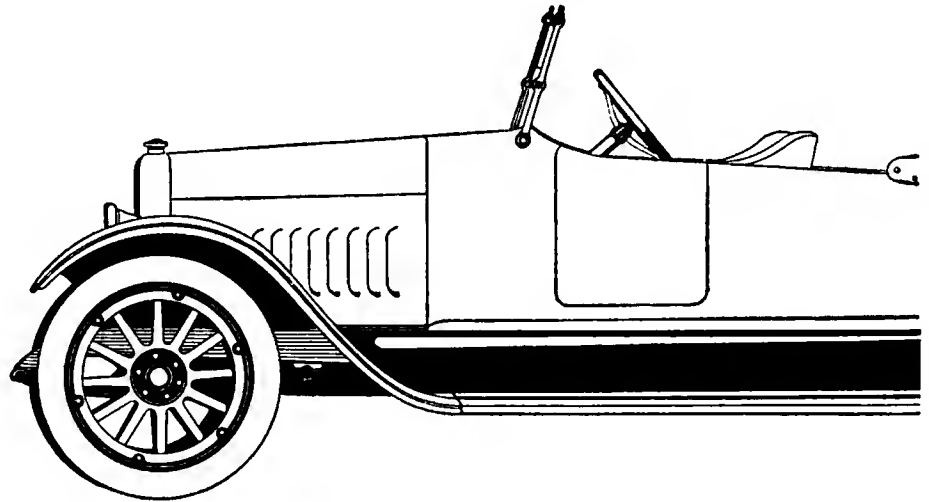
WYMAN-GORDON  
COMPANY

Cleveland

Worcester, Mass.

Detroit





The success of the Hal Motor Car Company in bringing its 12-cylinder valve-in-head car to a high state of perfection in a remarkably short space of time is due in a large measure to having successful business men as owners and directors of the company. On the board of directors are: Amos N. Barron, of the National Carbon Company; F. F. Prentiss, Vice-President, The Cleveland Twist Drill Co.; F. H. Ginn, of the law firm of Tolles, Hogsett, Ginn & Morley; C. C. Homan, Vice-President, The Hal Motor Car Company; Geo. E. Randels, Vice-President, The Foote-Burt Company; E. G. Tillotson, of Tillotson & Wolcott Co. (Investment Bonds); A. W. Foote, President, The Foote-Burt Company; R. B. Sherridan, President, American International Corporation; Frank B. Willis, Vice-President, The Hal Motor Car Company. The motor is a 12-cylinder Valve-in-head with S. A. E. rating 39.6 H. P. It develops at 2000 R. P. M. 70 H. P. (brake test) and 100 H. P. at 3000 R. P. M. (brake test). Gasoline consumption, 10 to 12 miles per gallon. Its wheel-base is 135 inches and weight 3975 lbs. with a Turning Radius of 21½ feet. Leon Rubay Bodies, with Warner-Lenz lamps.

Hal Motor Car Company - Cleveland, Ohio

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# Have You Selected Your Power Unit for 1917

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If you are not familiar with the good points of the SPILLMAN Motors, it would certainly pay you to investigate them thoroughly before making your selection of an engine for 1917.

In addition to their simplicity and sturdiness of build throughout, the SPILLMAN Motors (4, 6, and 8-cylinder) possess several attributes of unusual interest and value.

They are lubricated by a system extraordinarily efficient, a system which many competent engineers have declared to be the most satisfactory yet devised.

## SPILLMAN "8"

The easy accessibility of parts to which access is required has been favorably commented upon by all who have examined the SPILLMAN. This is particularly true of the "8," as with most 8-cylindered motors accessibility has been a problem only partially solved.

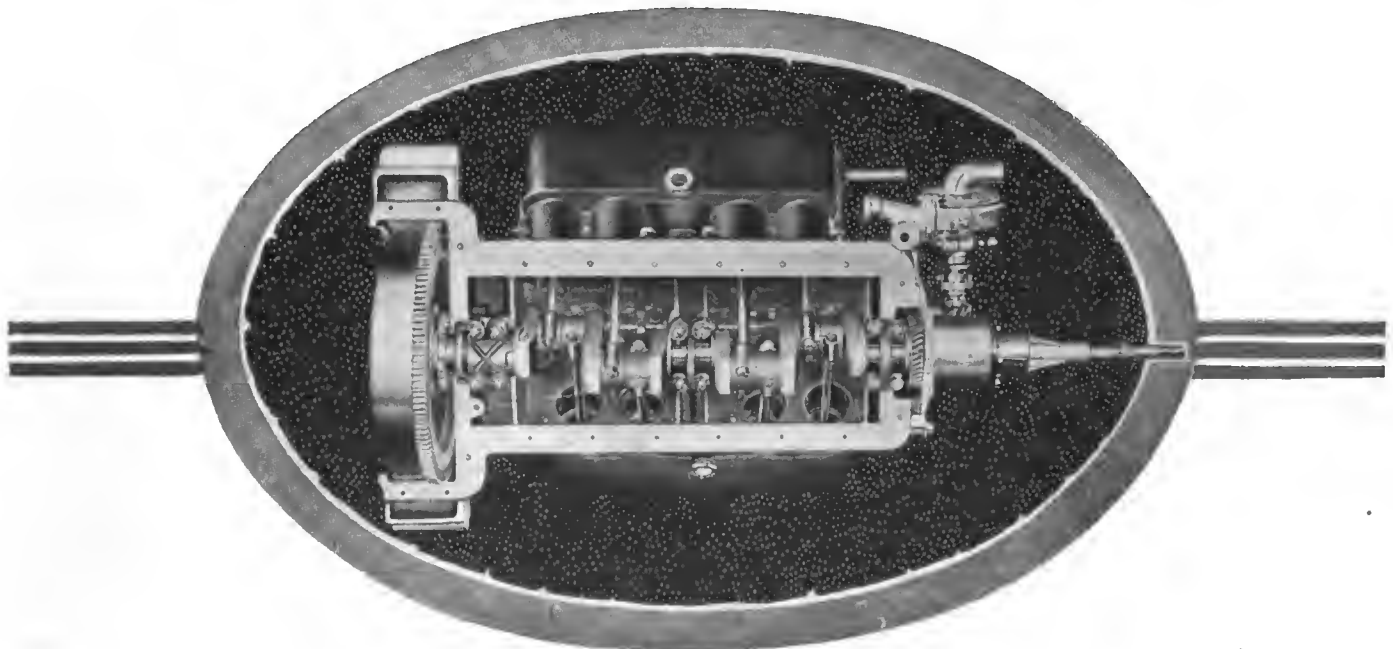
The cooling system of the SPILLMAN is remarkable for its simple efficiency and freedom from troublesome possibilities.

The fast-growing demand for these motors has necessitated our building a large new factory. Already advance orders for 1917 have exceeded all previous years, but with this new factory fully equipped we are prepared to take care of all demands, and can promise you prompt and certain shipments.

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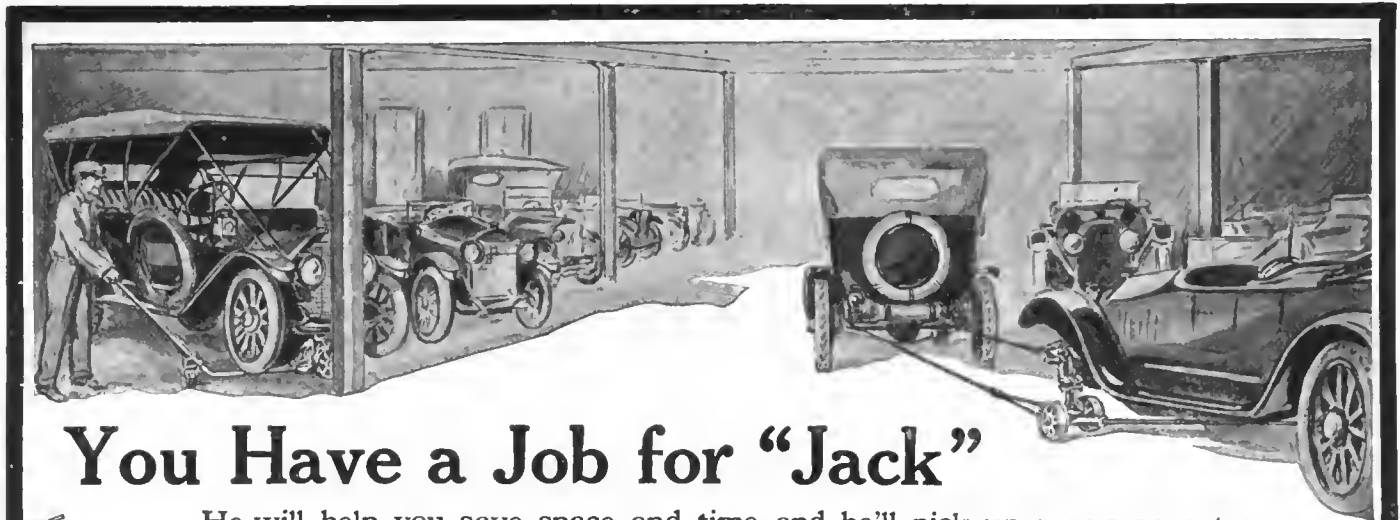
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He will help you save space and time and he'll pick up many an extra dollar for you, towing wrecks and disabled cars. "Jack's" full name is —

### Ellis-Smith Combination Jack

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"Jack" enables you to turn a car in its own length. To fit a car into any corner or behind any post. To pack them in so close (without worry of bent fenders or broken lamps) that you can increase your salable space from 25 to 50 per cent.

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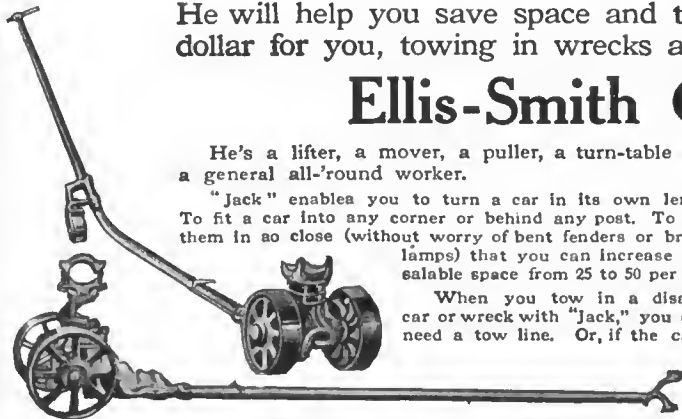
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No garage man should be without an Ellis-Smith Combination Jack. Send today for literature describing "Jack" and other members of "Jack's" family that will also save you work, time and money. WRITE US NOW.

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| Cole         | Knight        | Monroe        | Chase Truck     |
| Reo          | Saxon         | Singer        | Wilcox Trux     |
| Paige        | Stutz         | Stephens      | Sterling Truck  |
| Peerless     | National      | Dodge         | Republic Truck  |
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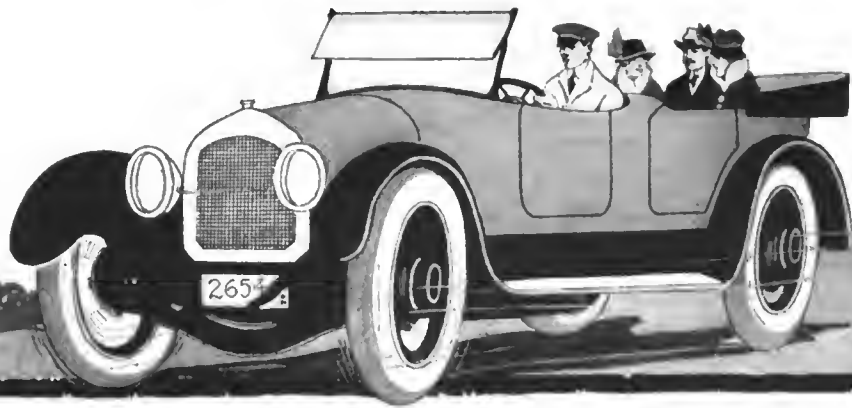
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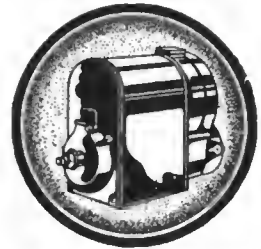
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When you KNOW every explosion will give you ALL its power—that's when motoring is solid satisfaction. The

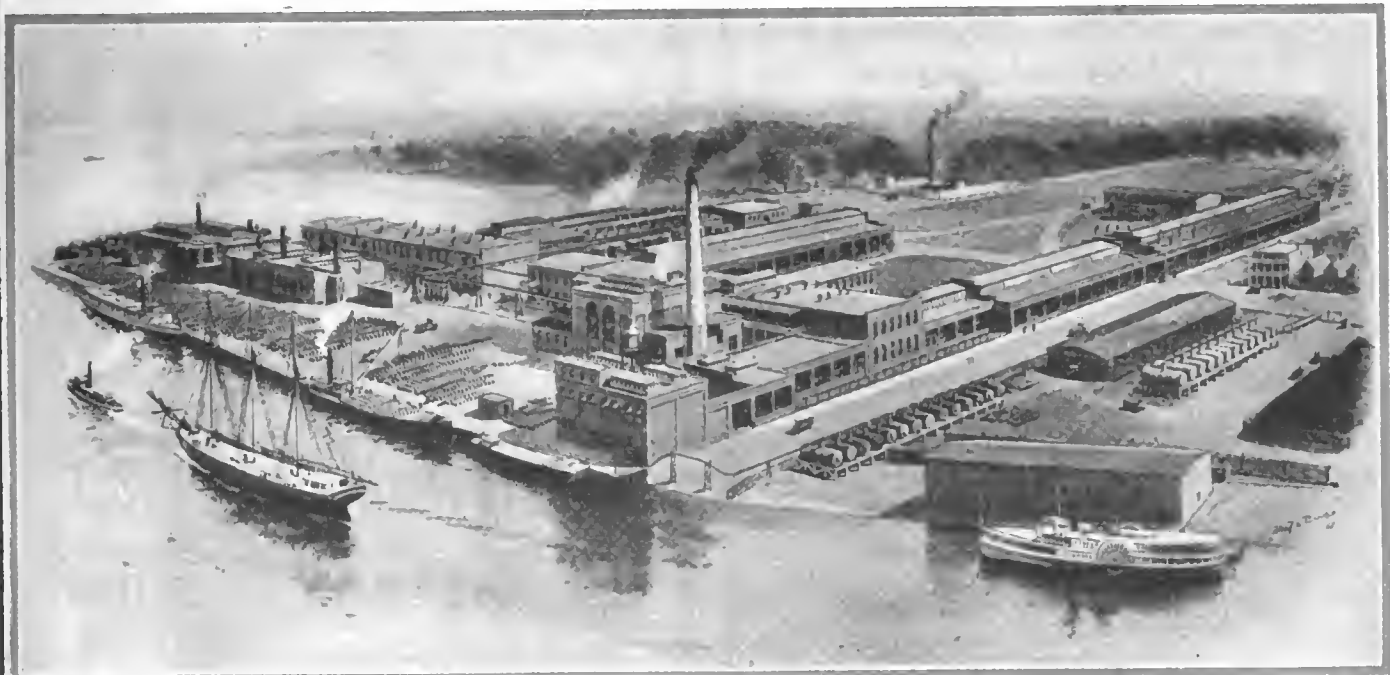
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makes complete combustion certain. It drives its intense, penetrating spark through the densest compression. Mixture rich or lean, motor racing or barely turning over, you'll be sure of full power if your car is Eisemann equipped!



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are built  
to withstand excessive shock and  
abuse. The material used must  
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used by most of the leading gear  
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If there are Laminated Shims in the crankshaft and connecting rod bearings of the car you are overhauling, you will find it takes less than half the time you otherwise take to adjust bearings.

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Laminum is a one-piece shimming material made up of thin leaves of hard brass held in a compact mass by a metallic binder. When you adjust bearings all you have to do is to raise a corner of the top leaf with a knife and peel it off. The size of the shim is reduced a definite amount (.002" or .003") for each leaf removed.

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Do you have to slip your clutch to slow down and coax the engine to "get away"? Or will your ignition let the motor barely turn over one moment and race the next?

You can do this with the

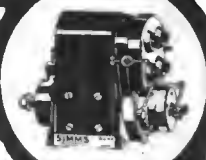
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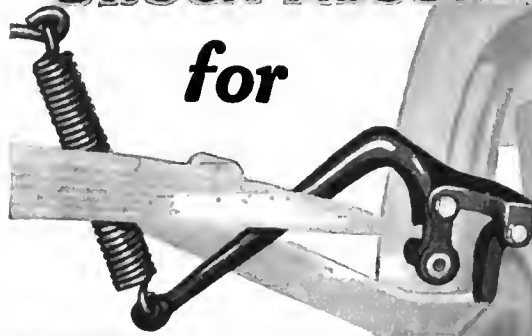
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## Shock Absorbers

for



# FORDS

### Are a Standard Necessity

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AITCHANDEES are an ornament to the car. They can be attached easily. No holes to bore.

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**DEALERS:** The AITCHANDEE is soundly built. It is tremendously popular now. 100,000 Fords AITCHANDEE equipped. We are conducting a national campaign of advertising, bringing our product to the attention of every Ford owner. Attractive terms and rapidly increasing volume. Better get in touch with us and get in line for some of this sure-fire business.

Price

**\$10 For Set of Four**

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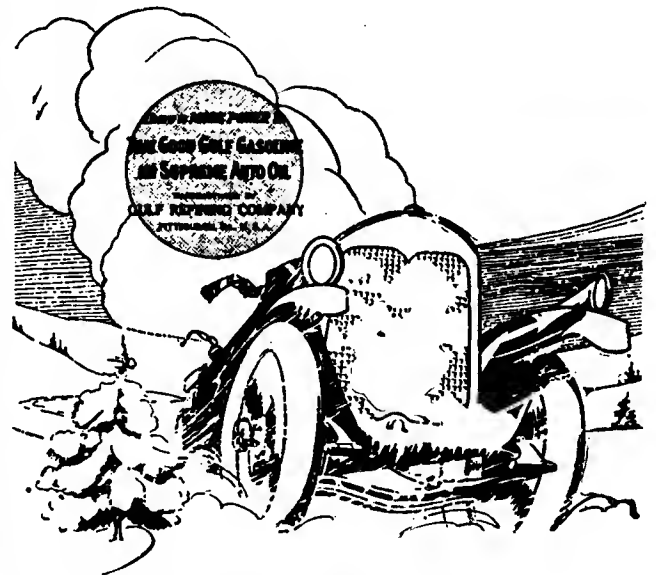
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Manufacturers desiring representation are requested to communicate with us immediately.

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Flows Freely at Zero. Starts with the Engine

This is most important during the winter months. You should know whether the oil you are using "flows freely at zero." All oils do not possess this feature—notably the paraffine base oils, which thicken up under cold and often cause great damage to the motor.

The safe way is to ask for SUPREME AUTO OIL—it "Flows Freely at Zero" and leaves less carbon, owing to the fact that it is a Southern Asphalt-base oil containing no paraffine to gum, stick or thicken.

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### Durability — the Result of Careful Manufacturing

The extreme care used thruout the manufacturing of *Warner Gear Company* products as well as the close inspection of all operations, shows up in the dependable service which Warner Gear Company products universally give.

Get Warner service from your next car, assuring yourself that it is equipped with a *Warner Gear Company transmission, differential, steering gear and clutch.*

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## IT IS JUST AS EASY AS A-B-C TO KEEP YOUR MOTOR CARBON-FREE



80% of engine trouble is caused by carbon. That knocking sound and loss of power is due to carbon in your cylinders. Clean them out with *Johnson's Carbon Remover* and your car will run like it did the first 500 miles.

Clean cylinders reduce the consumption of gas from 12% to 25%—giving you the maximum power and speed from the minimum amount of fuel.

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If your dealer cannot supply you, send us \$1.00 (bill or stamps) and we will send you enough Johnson's Guaranteed Carbon Remover to thoroughly clean an ordinary four cylinder motor three times.

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BERWYN, PENNSYLVANIA  
SOLE MANUFACTURERS OF NON-GRAN AND LARGEST EXCLUSIVE MANUFACTURERS OF BEARING BRONZE IN THE WORLD

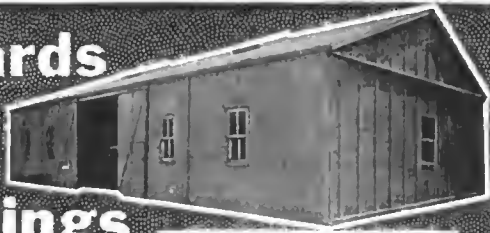
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Our Engineering Force At Your Disposal

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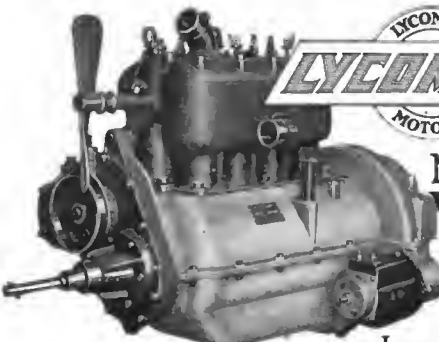
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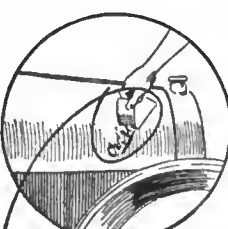
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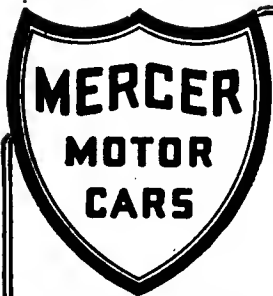
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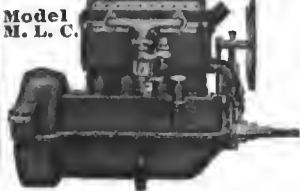
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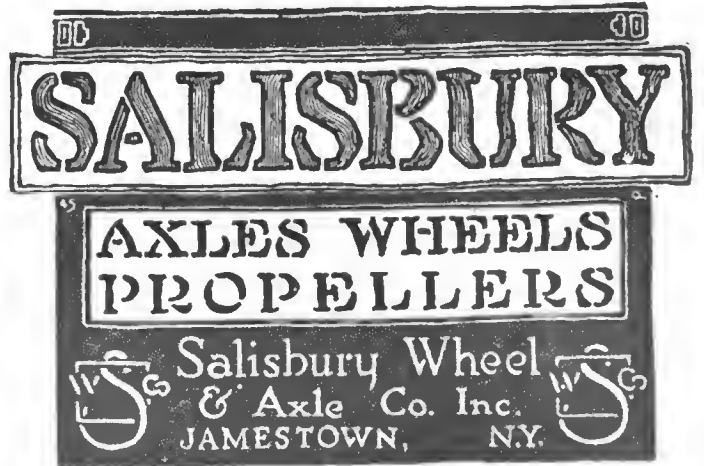
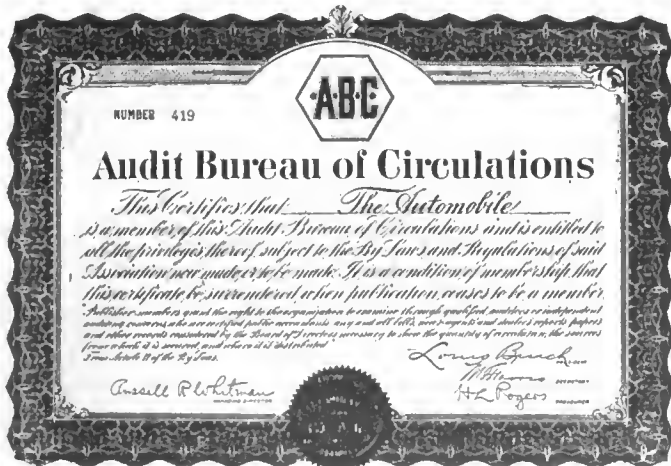
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## Motorist's

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Slightly used, 35 by 4..... 6.75  
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30 x 3 1/2	6.00	3.60
32 x 3 1/2	6.25	3.65
34 x 4	7.75	5.00
34 x 4 1/2	9.50	6.60
35 x 4 1/2	10.00	6.75
36 x 4 1/2	10.00	6.90
37 x 5	12.00	8.20

All Sizes from 28 x 3 to 38 x 5 1/2 in Stock.

Tires, Fisk, Red and Gray Tops, 2nd's. Special Prices.

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Fresh Selected Stock—Standard Makes Guaranteed

Size	New Tires	New Tubes	Size	New Tires	New Tubes
28x3	\$ 6.00	\$1.50	34x4	\$13.75	\$3.35
30x3	6.50	2.00	35x4	14.00	3.45
30x3 1/2	8.50	2.25	36x4	14.50	3.50
31x3 1/2	9.00	2.50	36x4 1/2	16.75	4.00
32x3 1/2	9.50	2.50	36x4 3/4	17.50	4.15
34x3 1/2	10.00	2.55	36x4 1/2	18.00	4.25
36x3 1/2	11.25	2.75	37x4 1/2	18.50	4.35
31x4	12.25	2.90	38x5	18.00	5.00
32x4	18.00	3.20	38x5	19.00	5.00
33x4	18.25	3.25	37x5	20.50	5.20

Add 10% for non-skid.

### Bargains in Slightly Used Tires

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30x3	\$ 3.50	\$1.85	35x4	\$ 8.00	\$1.75
30x3 1/2	4.25	1.45	36x4	8.00	1.75
31x3 1/2	5.00	1.50	34x4 1/2	8.50	1.75
32x3 1/2	5.75	1.50	35x4 1/2	8.50	1.80
34x3 1/2	6.00	1.60	36x4 1/2	8.75	1.85
31x4	6.75	1.65	37x4 1/2	10.00	1.90
32x4	7.50	1.60	36x5	9.00	2.00
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30x3 1/2 non skid

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30 x 3	5.50	\$6.75	1.90
30 x 3 1/2	6.95	7.50	2.15
32 x 3 1/2	7.95	8.75	2.25
34 x 3 1/2	8.85	9.75	2.35
31 x 4	9.65	10.95	2.45
33 x 4	9.85	10.95	2.50
35 x 4	9.95	10.95	2.55
36 x 4 1/2	10.95	11.95	2.65
35 x 4 1/2	12.95	13.95	4.10
36 x 4 1/2	13.50	14.50	4.15
37 x 5	15.95	16.95	5.05

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## TIRES—TUBES

Fresh Selected Stock—Standard Makes Guaranteed

Size	New Tires	New Tubes	Size	New Tires	New Tubes
28x3	\$ 3.00	\$1.25	34x4	\$13.75	\$3.35
30x3	6.50	2.00	35x4	14.00	3.45
30x3 1/2	8.50	2.25	38x4	14.50	3.50
31x3 1/2	9.00	2.50	34x4 1/2	13.75	4.00
32x3 1/2	9.50	2.50	35x4 1/2	17.50	4.15
34x3 1/2	10.00	2.55	35x4 1/2	18.00	4.25
36x3 1/2	11.25	2.75	37x4 1/2	18.50	4.33
31x4	12.25	2.90	35x5	18.00	5.00
32x4	13.00	3.20	38x5	19.00	5.00
33x4	13.25	3.25	37x5	20.50	5.20

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32x3 1/2	5.75	1.50	35x4 1/2	3.50	1.80
34x3 1/2	3.00	1.80	38x4 1/2	3.75	1.35
31x4	3.75	1.35	37x4 1/2	10.00	1.90
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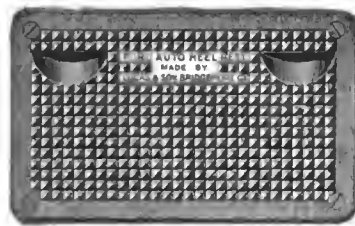
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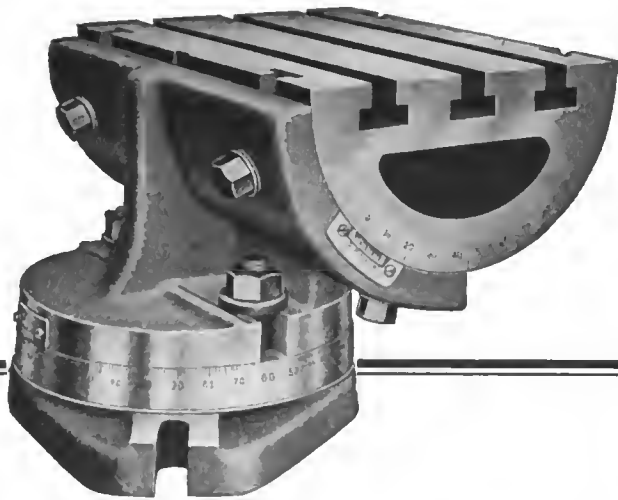
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**THE CENTRAL STEEL CO.**  
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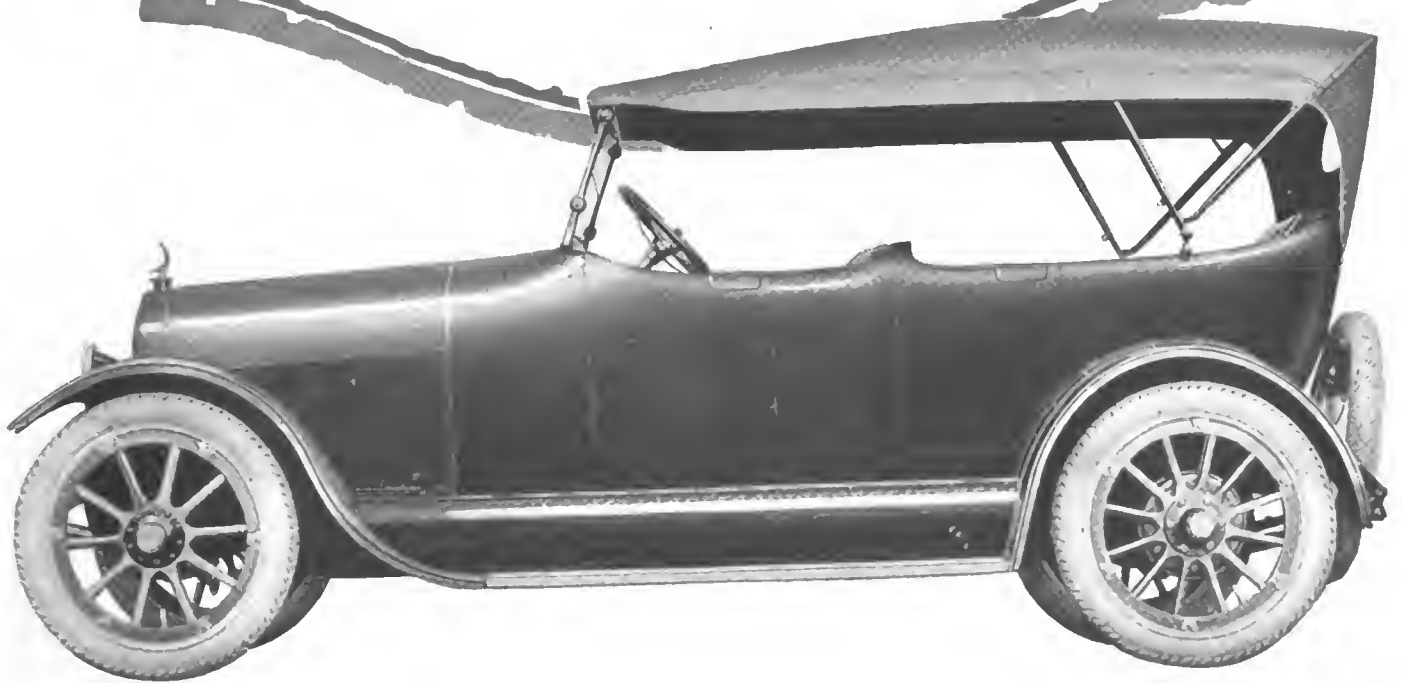
<i>Six-43 Touring</i> \$1295	<i>Six-43 Roadster</i> \$1295	<i>Six-43 Cabriolet</i> \$1950	<i>Six-66 Coupe</i> \$2250
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who are considering an addition to or a change in their lines; also high-class men who are contemplating entering the automobile field—men of good moral standing in their communities and with the necessary financial backing—are invited to write us.

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# The AUTOMOBILE

Maud L'Anphere Crook  
Stanford University, Cal.

Vol. XXXVI  
No. 6

NEW YORK, FEBRUARY 8, 1917

Ten cents a copy  
Three dollars a year



*Motors vary in number of cylinders, in design, in construction. But there is only one that is recognized as standard—the Continental.*

Several hundred manufacturers of motor vehicles in the United States compete actively for the favor of the buying public. Many of them build their own motors, each with entire confidence that his motor is superior to the others. But more than 150 manufacturers of automobiles and motor trucks agree that among all present-day motors the Continental stands foremost. They express their conviction in the most sincere way: by using the Continental Motor in their product.

That their confidence is not misplaced is indicated by the notable success of these manufacturers, for their judgment is supported by that of the motoring public, who, after trying all the various types of motors, approve the Continental as America's standard.

## CONTINENTAL MOTORS CORPORATION

Offices:  
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*Largest exclusive motor manufacturers in the world.*

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Live dealers everywhere find Stewart Products ready money makers—fast, consistent sellers—Winter and Summer.

Profit by their experience.

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Don't clutter up your shop with a slow moving stock.

Handle accessories like the Stewart Vacuum System. It's on over 70% of all makes of cars for 1917. And thousands of old cars still need it. It's the one system that's cured of all the ills of other gasoline systems.

The Stewart Tire Pump is another big seller. So are Stewart Warning Signals, Stewart V-Ray Spark Plugs, Stewart Speedometers for Fords.

Put in a good, strong stock of these Stewart Products.

They will mean lots of jingling dollars in your pocket before the year is over.

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for Fords

\$10



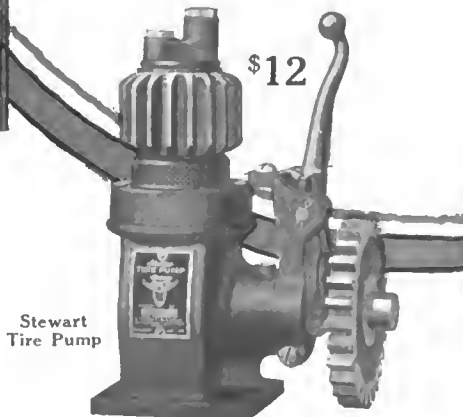
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\$3.50



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\$50



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Motor Driven  
Warning Signals

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Stewart V-Ray  
Spark Plug

\$1

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in four body models of exceptional comfort, convenience and luxury, each mounted on that powerful chassis—still further refined—which achieved the sixteen famous King road records of last year. Can you get more by paying more is the question these cars will ask you.

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Prices F. O. B. Detroit

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DETROIT

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SIXTY HORSE POWER



FOUR PASSENGER, FOURSOME — \$1585



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SEVEN PASSENGER SEDAN — \$2150

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*"The Car of No Regrets"*

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### OILZUM VICTORIES IN 1916

RACE	DISTANCE	SPEED	WINNER	CAR	OIL
First: In Ascot Sweepstakes, Los Angeles, March 5	100 miles	68.18 m.p.h.	Pullen	Mercer	Oilzum
First: In Match Race, Los Angeles, March 19	50 miles	69.28 m.p.h.	O'Donell	Duesenberg	Oilzum
First: In Corona Grand Prize Race, California, April 8	300 miles	86.5 m.p.h.	O'Donell	Duesenberg	Oilzum
First: In Ascot Motor Derby, Los Angeles, April 16	150 miles	67.4 m.p.h.	O'Donell	Duesenberg	Oilzum
First: In Fresno, Cal., Road Race, April 29	300 miles	61.01 m.p.h.	O'Donell	Duesenberg	Oilzum
First: In Coney Island Cup Race, May 13	20 miles	106.71 m.p.h.	Aitken	Peugeot	Oilzum
First: In Metropolitan Trophy Race, New York, May 13	150 miles	96.53 m.p.h.	Rickenbacher	Maxwell	Oilzum
First: In International Sweepstakes, Indianapolis, May 30	300 miles	84.05 m.p.h.	Resta	Peugeot	Oilzum
First: In Chicago Auto Derby, June 11	300 miles	98.61 m.p.h.	Resta	Peugeot	Oilzum
First: In Sioux City Speedway Race, July 8	20 miles	78.40 m.p.h.	Wilcox	Premier	Oilzum
First: In Sioux City Speedway Race, July 8	50 miles	72.57 m.p.h.	Wilcox	Premier	Oilzum
First: In Omaha Speedway Race, July 15	150 miles	99.02 m.p.h.	Resta	Peugeot	Oilzum
First: In Tacoma Montamarathon, August 5	300 miles	89.30 m.p.h.	Rickenbacher	Maxwell	Oilzum
First: In Speedway Grand Prix, Chicago, August 19	50 miles	100.42 m.p.h.	Resta	Peugeot	Oilzum
First: In Cincinnati Derby, September 4	300 miles	97.06 m.p.h.	Aitken	Peugeot	Oilzum
First: In Harvest Auto Racing Classic, Indianapolis, September 9	20 miles	95.08 m.p.h.	Aitken	Peugeot	Oilzum
First: In Harvest Auto Racing Classic, Indianapolis, September 9	50 miles	91.83 m.p.h.	Aitken	Peugeot	Oilzum
First: In Harvest Auto Racing Classic, Indianapolis, September 9	100 miles	89.44 m.p.h.	Aitken	Peugeot	Oilzum
First: In Astor Cup Race, New York, September 30	250 miles	104.83 m.p.h.	Aitken	Peugeot	Oilzum
First: In Grand American Race, Chicago, October 14	250 miles	103.99 m.p.h.	Resta	Peugeot	Oilzum
First: In Harkness Gold Trophy Race, New York, October 28	100 miles	105.95 m.p.h.	Aitken	Peugeot	Oilzum
First: In Vanderbilt Cup Race, Santa Monica, November 16	294 miles	86.98 m.p.h.	Resta	Peugeot	Oilzum
First: In Grand Prize Race, Santa Monica, Nov. 18	403 miles	85.59 m.p.h.	Aitken	Peugeot	Oilzum
First: In Ascot Derby, Los Angeles, November 30	150 miles	67.54 m.p.h.	Rickenbacher	Duesenberg	Oilzum

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**The AUTOMOBILE**  
 THE CLASS JOURNAL COMPANY  
 231-241 W. 39th STREET NEW YORK CITY  
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**WYMAN-GORDON**

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**MAKING SURE**

*"Make Sure" is the watchword of Wyman-Gordon.*

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**O**UR GUARANTEE certifies that we have made sure to the full extent of our ability.

THE HIGH QUALITY OF WYMAN-GORDON products extends beyond the quality of steel used and the character of workmanship involved. It includes designing, the capable handling of manufacturing problems submitted to us, the co-operation offered by a staff of experts who have concentrated upon this particular subject of "forgings to fit the case."

THIS STANDING OFFER OF CO-OPERATION HAS BEEN ACCEPTED by manufacturers and engineers standing among the very highest in the industry. And they have accepted it not only because it brings the best results, but also because it is undoubtedly the most economical method they could possibly pursue.

**WYMAN - GORDON CO.**  
 WORCESTER, MASS.  
*Cleveland Detroit*

**GUARANTEED FORGINGS**

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**Not a selected dealer  
nor a picked territory  
but —  
an entire state for a whole year**

# **Wyoming.**

**Shows a 344% increase  
in Studebaker sales over  
last year.**

**The advantage of having  
Studebaker value back of you**

**E**VER see more convincing proof of a car's quality? 344% increase in 1916 over 1915 sales in this ONE State!

And remember—this striking increase in Studebaker sales in Wyoming is not the work of just one energetic dealer, or of a dealer who's lucky in his territory. It covers the **WHOLE State**—ALL the dealers in the State—all the varying local sales conditions. And just one thing made it possible—**STUDEBAKER VALUE BACK OF EVERY DEALER.**

This record of the Wyoming dealers, and the constantly increasing sales of Studebaker cars in every other State, is convincing evidence of

Studebaker **VALUE.** It demonstrates conclusively that Studebaker is the easiest fine car on the market for a dealer to sell.

Selling a car designed in thorough accord not only with what the buying public wants but also with what the whole industry approves as **GOOD engineering practice**—and with Studebaker **VALUE** back of him—a Studebaker dealer's selling efforts are bound to be more productive. That's why it pays to be a Studebaker dealer!

## **STUDEBAKER**

South Bend, Ind.

Detroit, Mich.

Walkerville, Ont.

Address all correspondence to Detroit

**It pays to be a *Studebaker* dealer**

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# The AUTOMOBILE

VOL. XXXVI

NEW YORK—THURSDAY, FEBRUARY 8, 1917—CHICAGO

No. 6

## To Build Sunbeam Engines in U. S.

### Sterling Co. Secures Manufacturing Rights—Twelve-Cylinder Out Next Sept.

BUFFALO, N. Y., Feb. 2—The Sterling Engine Co., this city, has secured the manufacturing rights for the production in America of Sunbeam engines. That this company had in its possession one of the latest twelve-cylinder Sunbeam aviation engines was a current rumor 3 months ago. The truth of this report is now confirmed. The company hopes to have an American-made Sunbeam twelve-cylinder aeroplane engine running about September of this year.

Considerable difficulty, it is stated, was experienced in obtaining permission from the British Admiralty for the export of particulars regarding the Sunbeam products, but this was eventually overcome.

### 5,000 Jordans for 1917

CLEVELAND, Feb. 7—The Jordan Motor Car Co., this city, will turn out 5,000 cars in 1917. President E. S. Jordan, in a report at the annual meeting, stated that between beginning of production in August and Jan. 1, more than \$1,000,000 worth of materials were used and paid for. A production of ten complete cars per day is the present output. The same officers and directors were elected for the coming year.

### Engineers Agree on One Grade of Fuel

DETROIT, Feb. 7—Automobile engineers and oil company representatives met here today and agreed on a gasoline ordinance. The ordinance proposed calls for one grade of fuel which will show a total of 20 deg. boiling at 220 deg. Fahr. The fuel can either be distillate or cracked. The experts from the oil companies wanted 16 per cent boiling at 212 deg. claiming it better for warm weather,

but the automobile engineers refused, stated it unsatisfactory for winter and the 20 deg. was named instead.

Those in attendance at the meeting were Inspector J. C. McCabe, Municipal Safety Engineering Dept.; C. C. Hinkley, chief engineer of the Chalmers company; W. O. Thomas, consulting engineer; A. R. Miller, E. D. Johnson of the Indiana Standard Oil Co.; J. Ravn, Rath Oil Co.; K. W. Zimmerschied, chief metallurgist of the General Motors Co.; Russell Huff, chief engineer of the Dodge company; G. Holley, of the Holley Bros. Co.; D. McCall White, chief engineer of the Cadillac company; J. G. Vincent, vice-president of the Packard company; Guido Behn, chief engineer of the Hudson company, and R. L. Francis, of the Central Oil Co.

### U. S. Standard Screw Thread Tolerances Invoke S. A. E. Aid

WASHINGTON, D. C., Feb. 6—On Jan. 10 a bill was introduced in Congress by Mr. Tilson to provide for the appointment of a commission to standardize screw thread tolerances, so that the War Department and other government departments which purchase machinery would make the same demands in this respect. The suggestion is that the commission shall contain government representatives from different departments and appointees of the American Society of Mechanical Engineers.

### To Consult Manufacturers

A hearing took place yesterday for the purpose of a discussion of this bill and among those invited to attend was the Society of Automotive Engineers, in order that information could be given regarding the S. A. E. fine pitch threads established in 1906. It appears that in the formation of the suggested standards makers of taps and screws will be consulted as well as users, and it is the belief of Dr. Stratton, director of the Bureau of Standards, that it will be possible for the industry and the government department to agree upon a practice which both can follow.

## S. A. E. Council Plans for 1917

### Approves Entire Draft of Standards Committee—No Boat Trip This Year

CHICAGO, ILL., Feb. 1—The regular January meeting of the Council of the Society of Automobile Engineers was held this afternoon at the Chicago Automobile Club, the session partaking largely of organization work for the present year. The entire draft of the Standards Committee was approved by the Council, and Chairman John G. Utz has now his organization complete and decks cleared for 1917 standards work.

The Council voted unanimously not to take a boat trip during the mid-summer meeting as has been the custom for the past 2 years. This is largely due to the fact that the activities of the society have been very materially broadened because of consolidation with such other engineering bodies as aviation, tractors, and marine motoring. The capacity of the largest available lake steamers suitable for summer sessions was reached last year, and it was impossible to secure adequate accommodation for the enlarged society on any boat. It has not been definitely settled where the summer session will be held, but the 1917 meetings committee has the matter in hand and hopes to make some definite announcement in the near future.

### Winter Meeting in Chicago?

There has been some talk around the automobile show this week along the line of holding the winter meeting of the society next year in Chicago. Each year sees Chicago's great business show increasing in this field and the representation of the industry is generally greater at Chicago than at New York. The suggestion that the S. A. E. hold its dinner and winter meeting in this city has met with generally favorable re-

(Continued on page 322)

## Fiat Co. To Build Small Car

Will Sell at About \$2,000 and Will Be Announced When Peace Is Declared

NEW YORK, Feb. 3—The F. I. A. T. Co., Poughkeepsie, N. Y., will invade the medium-priced automobile field as soon as peace is declared, according to J. S. Josephs, of the American company, who arrived here Feb. 1 after a trip to the factory of the parent Fiat company in Turin. As soon as the war is over, the Fiat company will enlarge its Poughkeepsie plant to nearly ten times its present size and will produce on a large scale a car selling around \$2,000. The arrangements for building a medium-priced car will not mean the discontinuing of the higher-priced models.

Mr. Josephs, who was formerly treasurer of the company, is now in charge of American manufacturing and sales. The Italian company recently acquired control of the American factory, buying all of the stock of the Poughkeepsie factory except that held by Mr. Josephs.

The factory in Turin now employs 17,000 men and is turning out 2000 motor vehicles a month. It also has a monthly output of sixty aeroplanes. The Poughkeepsie plant, it is stated, will probably put an aeroplane engine on the market.

Mr. Josephs declared there is no possibility of the Fiat company shipping two of its racing cars to the United States on account of conditions in Italy, where all of the automobile production is under government control. A special permit must be obtained from the Rome authorities who are usually reluctant in such matters on account of the need of automobiles in the army at the present time.

The Italian factory has been enormously increased since the outbreak of hostilities. On two occasions the capital has been increased, until it now stands at 29,750,000 lire, roughly \$5,900,000. A new four-story factory is now being constructed. A chassis test track is being built on the roof. This factory, it is stated, will alone be able to produce 20,000 complete cars a year.

### Velie to Advance Prices \$50 on Open Cars

NEW YORK, Feb. 2—The Velie Motor Vehicle Co. will advance its prices \$50 on March 1 on all its open cars. On that date the following prices will prevail: Model 28, five-passenger touring, \$1,185; with detachable sedan top, \$1,385; four-passenger companionable roadster, \$1,185; two-passenger roadster, \$1,165.

Model 27, seven-passenger six, will sell for \$1,650.

The closed body types are the four-passenger coupe at \$1,750, the touring sedan at \$1,685, and the town car at \$2,250.

### Acme Truck Prices Advanced

CADILLAC, MICH., Feb. 6—Prices of Acme trucks produced by the Cadillac Auto Truck Co. have been advanced, effective Feb. 15. The new prices are: One-ton, \$1,575 instead of \$1,500; 2-ton, \$2,200 instead of \$2,100; 3-ton, \$3,000 instead of \$2,900. All orders booked prior to Feb. 15 with deposits will be subject to the old prices.

### N. A. C. C. Forms Export Department

DETROIT, Feb. 5—The National Automobile Chamber of Commerce recently voted to form an export department for the benefit of its 101 members. Exports for 1916 were about \$96,000,000, or 10 per cent of the entire motor car production.

### Hayden Resigns from Pullman

YORK, PA., Feb. 2—H. W. Hayden has severed connections with the Pullman Motor Car Co. and is about to enter into another manufacturing business. Mr. Hayden was formerly general manager. That office has been abolished and in its stead all departments will report to the operating board, consisting of Messrs. Keyworth, Hoff and Schmidt.

### Ford Trucks Ready in April

DETROIT, Feb. 5—It is reported that the Ford Motor Co. will produce a truck and will have it ready to sell by April 1. The reports add that the company has contracted for material for 250,000 of these trucks.

## Simplex Working on New Four

Town Car Chassis to Sell at \$4,000—L-Head Motor

NEW YORK, Feb. 3—The Simplex Automobile Co., New Brunswick, N. J., is working on a new four-cylinder town car, which will be brought out some time next winter. It will have an L-head, 4 by 5-in. motor, cast in block, developing about 35 hp. The chassis will sell for \$4,000. The wheelbase will be 125 in.

Capacity of the plant is now 500 of the sixes a year. The company expects to build about 800 of the fours a year.

The first motors of the Hispano-Suiza type, made by the Wright-Martin Aircraft Corp., in the local Simplex plant, have been most successful. Production of these motors is expected to reach capacity by March 1. The capacity of this plant is now 300 Hispano-Suiza motors per annum.

## To Reconsider N. Y. Truck Fees

Governor May Appoint New Commission to Determine Equitable Rate of Taxation

ALBANY, N. Y., Feb. 6—It is almost certain that Governor Whitman will appoint a new commission to determine a new schedule of fees for motor trucks and omnibuses in New York State to replace those ratified last week and which he signed. This is the result of a hearing before the Governor to-day attended by motor truck interests throughout the State, who pointed out that the Hewitt-Wells bills were unfair because they were railroaded through the Legislature without adequate hearings and because the taxes were based on gross weight of vehicle and load with no consideration of speed, kind of tire, or weight per inch of tire width.

Upon these grounds a strong appeal was made for the repeal of these drastic truck bills. This will not be granted. Truck users will have to pay this year's fees at the new rate unless the commission to be appointed should determine upon its new rate before the end of the year. Then it is possible that a pro-rata share of the 1917 fees may be returned. All 1917 fees should be paid under protest.

It was urged at to-day's meeting that the new highway commission consist of a motor truck engineer, a highway engineer and a State engineer.

### Saxon Production Only Slightly Delayed

DETROIT, Feb. 5—Assembling is already being done in property just leased by the Saxon Motor Car Corp. following the fire at the company's plant last week, where \$500,000 damage occurred, and mill sites are being secured this week in which all production will immediately begin. The company has plenty of material for assembly on hand and as the necessary machinery can be secured at once it will be but a few days when all employees are again at work.

The service department was not damaged and is able to supply repair parts.

The fire, which started in a repair shop and passed from there to the test repair room and further into the factory, destroyed 200 cars.

The company is erecting a large plant on the outskirts of Detroit, and will hasten its completion, which was first planned for June 1 but will now probably be finished within 90 days. In the meantime business will be completely cared for by temporarily rented factory buildings.

## New Co. to Handle Pullman Sales

Capital \$250,000 — New Six Ready Soon—\$4,000,000 Business in 1916

YORK, PA., Feb. 6—The Pullman Motor Car Corp. has been formed in Delaware with a capital of \$250,000 for the purpose of marketing the entire output of the Pullman Motor Car Co. The latter company will continue to manufacture Pullman cars, but has turned the entire selling of them over to the newly-formed corporation.

The stock of the new corporation is held by the same interests that control the Pullman Motor Car Co., and the purpose of the selling organization is to assume all of the guarantees, financial obligations connected with the sale of the Pullman product. Existing contracts with all Pullman dealers continue as heretofore, and the new corporation will maintain all of the guarantees on all Pullman cars sold in the past as well as in the future.

During the past year the business of the Pullman Motor Car Co. approximated \$4,000,000, which was done on a capital of \$500,000, which was quite inadequate for such a total of business. Plans are under way for an increase of capital to provide sufficient working funds and for an increase in factory facilities.

Increased finances will be controlled by the present stockholders, who are largely business men of York and eastern Pennsylvania. J. C. Schmidt, formerly chairman of the board of directors, is president of the Smith Ault Paper Co. and director in many public utilities in eastern Pennsylvania. Geo. H. Schmidt, his brother, is a corporation lawyer. Carlton Hoff is production manager of the American Chain Co., York; W. A. Keyworth is president of the First National Bank, York, and J. E. Baker is a large coal and limestone operator in eastern Pennsylvania.

The company will bring out in a few weeks a new six-cylinder model at a very low price, and to be built in quantities.

**Cortex, New Substitute for Asbestos in Facing Disk Clutches**

INDIANAPOLIS, Feb. 5—A new material for facing disk clutches is being manufactured by the Hide, Leather & Belting Co. It is a composition containing a quantity of cork and will be sold under the trade name of Cortex. For this material it is claimed that the coefficient of friction is higher than that for asbestos compounds, and that prolonged use does not cause glazing or make the material

hard, and that there is no restriction in the supply of the materials. At the same time the cost is stated to be from one-half to one-third less than that of asbestos. The material is applied in exactly the same way as the ordinary rings for disk clutches, and the company is prepared to make facings interchangeable with asbestos facings for any dry disk clutch.

**Stephens Makes Organization Changes**

FREEMONT, ILL., Feb. 3—The Stephens Motor Branch of the Moline Plow Co., this city, has made several changes in the organization. H. C. Dunning has been appointed assistant to General Manager H. J. Leonard, and will take charge of his new post Feb. 15. J. E. Corbielle, formerly with an eastern company, has been appointed superintendent of the automobile department of the Stephens plant, to succeed R. A. Stickney, resigned to take service with an eastern concern. William Stewart has been appointed sales manager in charge of the southern Wisconsin and northern Illinois territory.

**Beijer Officers Re-elected**

STEVENS POINT, WIS., Feb. 3—All of the officers of the Beijer Hydraulic Transmission Co., this city, were re-elected at the annual meeting, as follows: President, N. A. Week; vice-president, R. K. McDonald; secretary-treasurer, F. D. Reynolds, and manager, Arthur Beijer. The company has completed the installation of its system in several models of automobiles for demonstration purposes.

## 12,456 Paige Cars in 1916

Co. Has Monthly Turnover Equal to Its Capitalization

DETROIT, Feb. 5—The Paige-Detroit Motor Car Co., in its recent report, showed that it has manufactured 12,456 cars in 1916 up to Nov. 25 as compared with 7749 cars for the year 1915 and 4631 in 1914. The total sales for 1915 were \$7,471,033.37, with a net income available for dividends of \$609,775.87. Total sales for the 10 months ending Oct. 31, 1916, were \$9,899,790.48, with a net income available for dividends of \$964,442.21. It now has a monthly turnover about equal to its capitalization.

In 1911 the authorized capital of the company was increased from \$100,000 to \$250,000, in 1915 to \$500,000, in May, 1916, to \$1,000,000, and again in September, 1916, to \$1,500,000. This latter now has a common stock market value of \$5,887,500. One thousand dollars invested in the Paige company in 1913 would now be worth \$36,988.

## Stewart-Warner Earns \$2,215,042

Surplus of \$2,105,967 Equal to 21 Per Cent on Common—\$638,556 in Dividends

CHICAGO, Feb. 3—The Stewart-Warner Speedometer Corp. for the year ended Dec. 31, 1916, showed net earnings of \$2,215,042. The corporation paid \$638,556 in dividends and the balance amounted to \$1,576,485.

The corporation laid aside \$241,500 in the sinking fund for retiring the preferred stock, making a total of \$1,817,986. In retiring some of the preferred stock last year, the corporation paid over a premium of \$70,690, leaving a balance of \$1,747,296. The property has been revalued at \$358,671, leaving a net surplus of \$2,105,967, equal to about 21 per cent of the \$10,000,000 common stock outstanding.

**66,000 Hayes Wheels in 1916**

ST. JOHNS, MICH., Feb. 5—At the annual meeting of the Hayes Motor Truck Wheel Co. the following officers were elected: President, C. B. Hayes; vice-president and treasurer, N. S. Potter; secretary and general manager, A. D. Smith; vice-president and timber manager, W. C. Morrey; superintendent, H. J. Kellar. These officers, with W. C. Durant, compose the board of directors.

A report of the year's progress showed 66,000 wheels were manufactured, bringing \$260,000. The payroll now covers 145 men. Prospects for 1917 were reported as good, enough orders being on the books to obviate the possibility of a shutdown during the year.

**Government Opens Bids on Caterpillar Tractors**

WASHINGTON, Feb. 6—Sealed proposals will be received at the office of the chief signal officer, War Department, this city, until Feb. 20, 1917, for furnishing caterpillar tractors of medium horsepower. The proposal number is 912.

**Weidner Joins Bedford Mfg. Co.**

PHILADELPHIA, Feb. 1—George G. Weidner, for the past three years manager of the Stewart-Warner Speedometer Corp.'s local branch, has resigned to become associated with the Benford Mfg. Co., Mt. Vernon, N. Y.

**Enos Is Torbensen Sales Mgr.**

CLEVELAND, Feb. 2—Robert C. Enos has resigned from the American Distributing Co. to become sales manager of the Torbensen Axle Co., this city.

## Chain of Accessory Stores Started

### New Sales Organization, Backed by \$1,000,000, to Operate from Kansas City

NEW YORK, Feb. 6—A huge accessory sales organization, backed already by \$1,000,000, has been started to run a chain system of accessory stores throughout the United States. The organization is backed by one of the biggest steel men in the country and will be pushed with unlimited capital until there is a chain accessory store in every large town or city in the country. The Equipment Co., Kansas City, Mo., will be the hub of this new venture, and the plan of the organizers is to buy or control several first class accessory businesses and put them in first class condition.

### New Castle Drops Unguaranteed Tire

NEW CASTLE, PA., Feb. 2—The New Castle Rubber Co., this city, will stop the manufacture of unguaranteed tires and will turn out a new tire, to be known as the Shenango tire, as soon as proper machinery is installed. The manufacture of the guaranteed New Castle tire will continue.

### 360 Continental Engines in One Day

MUSKEGON, MICH., Feb. 5—A record for the production of motors was made by the Continental Motors plant Jan. 31, when 360 finished motors were turned out. This number was forty-six more than any previous day's record. During January the company put out 6,536 motors, or an average of 272 1/3 daily for 24 working days. This is 980 more motors than ever turned out by the local plant in a single month. In December the record was 5556.

### National Shipments Gain 100 Per Cent

INDIANAPOLIS, Feb. 3—The National Motor Car Corp.'s shipments in January were 100 per cent ahead of the corresponding month last year and 50 per cent ahead of the requirements in order to dispose of the year's output. The sales for the month of February, it is stated, will be correspondingly good.

### Acme 3½-Ton Truck on Market

CHICAGO, Feb. 7—Cadillac Auto Truck Co., Cadillac, Mich., has added a 3½-ton truck to its Acme line. The power plant is a type E, four-cylinder Continental, developing 48 hp. The wheelbase is 168 in., the chassis length 243 in. The chassis is designed to accommodate a 14-ft. body, and has a gasoline capacity

of 27 gal. The price of the truck fully equipped is \$3,000.

The equipment includes Rayfield carbureter, Eisemann magneto and Stewart-Warner vacuum feed. The engine has a Pierce governor, limiting speed to 14 m.p.h. The transmission is mounted amidship with three point suspension, and is of the sliding clutch type, gear always in mesh. There are three speeds forward and one reverse. Timken axles and bearings are used.

### 100 Anderson Cars a Day

ROCK HILL, S. C., Feb. 5—The Anderson Motor Co., successor to the Rock Hill Buggy Co., this city, is turning out 100 cars a day, and arrangements are being made to double the capacity.

### Weart Bound Brook Bearing President

BOUND BROOK, N. J., Feb. 2—Spencer Weart has been elected president of the Bound Brook Oilless Bearing Co., this city. He was formerly secretary and vice-president, these offices having been abolished. George Smalley, formerly second vice-president, has become first vice-president, director and general manager. W. F. Jennings was appointed Eastern sales manager, and H. J. Lindsey Western sales manager, with offices in Detroit. A. K. Smith has become production manager.

### Fishburn Reads Paper on Gears

FLINT, MICH., Feb. 5—O. E. Fishburn, of the Mason Motor Co., read his second paper on gears here last week before the Automobile Technical Society. The paper dealt with straight and spiral bevel gears as used in the automobile differential from their earliest development to the present time. Mr. Fishburn is now preparing papers for future delivery on other types of gears.

## Steinmetz To Talk on Engines

To Lecture Before Philadelphia S. A. E. on Use of Combustion Engines in Modern War

PHILADELPHIA, Feb. 6—At the next meeting of the Pennsylvania Section of the Society of Automotive Engineers at the Engineers Club here Feb. 21, Joseph A. Steinmetz will lecture on the use of combustion engines in modern war. He has collected a great mass of information and photographs illustrating the use of motor vehicles on the fronts, with authentic pictures of the British tanks and also of some motor sleds which are quite new.

The Philadelphia section extends a most cordial invitation to other members to be present at this meeting.

## Chicago Salon Does Big Business

### Gains 500 % in Attendance—Re-engages Elizabethan Room for Next Year

CHICAGO, Feb. 5—In every particular the Chicago Salon of last week surpassed that of previous years. There was good business, an attendance of 12,000, which was 500 per cent more than last year, and additional floorspace. The charge of \$1 was made to keep out the less prosperous who would not be likely to buy a high-priced car. The management has contracted for the Elizabethan room in the Congress Hotel, where the salon was held this year, for 1918. Practically all of the available space has been allotted already, but it is hoped to enlarge the space by next winter.

There was good business with all exhibitors, and while sales were few inquiries were good. Louis Disbrow, showing his new racing car, stated to-night that he has contracted for over 170 cars wholesale through dealers and made seven individual sales. C. P. Kimball & Co., local body builders, reported more inquiries for custom-made bodies than a year ago. The White Co., which has been in the salon in New York and Chicago for the past 2 years, has made more individual sales at the salon than at the big show. Locomobile entered the New York and Chicago salons this year for the first time and was well pleased. The new Fageol was well received and several individual sales made. The Simplex has been doing good business in Chicago for over a year and made sales last week.

### S. A. E. Day at K. C. Tractor Show

NEW YORK, Feb. 7—A tractor meeting of the Society of Automobile Engineers will be held in connection with the Kansas City Tractor show on Wednesday, Feb. 14, in Kansas City. That day will be known as S. A. E. day at the tractor show, which is the largest tractor show held, and one which bears the same relationship to the tractor industry that the New York and Chicago automobile shows bear to the automobile industry. There will be a tractor supper held at Hotel Baltimore on that evening, which will be followed by several engineering talks on tractor matters. President Geo. H. Dunham, and General Manager Coker Clarkson will explain the standardization work of the society. As a tractor division of the standards work of the society has been formed, it is expected that considerable impetus will be given to tractor standardization at this first get-together of the tractor people, and the S. A. E.

## M. & A. M. Appoints Committees

### Executive Body Headed by Stiger—Girl Is Show Committee Chairman

NEW YORK, Feb. 6—The Motor and Accessory Manufacturers' Association has appointed the various committees to serve for the ensuing year. President C. W. Stiger will act as chairman of the executive committee. Those serving on this committee with Mr. Stiger are C. E. Thompson, E. H. Broadwell, J. H. Foster, W. O. Rutherford, Christian Girl and A. P. Sloan, Jr.

First Vice-President C. E. Thompson has been appointed chairman of the finance committee, which is composed of the same men who constitute the executive committee.

The show and allotment committee will this year be headed by Christian Girl, who will be assisted by C. E. Thompson, E. H. Broadwell, J. H. Foster, and W. C. Rands.

W. M. Sweet, former manager of the association, and who has for several years conducted the annual banquet, has been appointed chairman of the banquet committee, and will be assisted by E. H. Broadwell, T. J. Wetzel, J. H. Foster and Christian Girl.

The membership committee is composed of E. W. Beach, E. H. Broadwell and T. J. Wetzel. C. W. Stiger, Secretary A. P. Sloan, Jr., and Treasurer L. M. Wainwright compose the auditing committee, while the aeronautic committee consists of Messrs. Stiger, Thompson and Sweet.

#### Campbell Resigns from Stutz

CHICAGO, Feb. 7—Henry F. Campbell has resigned his position as secretary-treasurer of the Stutz Motor Car Co., Indianapolis. He will devote his time to private interests, and retain his stock interest in the company, of which he was a founder. William B. Thompson, formerly sales manager, succeeds him.

#### Chalmers Output Practically Sold

DETROIT, Feb. 6—The automobile show at Chicago witnessed closing of contracts for approximately 30,000 cars between dealers and the Chalmers Motor Car Co., practically taking the entire output of the company for 1917. One dealer signed a contract for 2700 cars for a single county.

#### Gordon Tire to Build

CANTON, OHIO, Feb. 2—The Gordon Tire & Rubber Co. has purchased three acres of land adjoining its plant and will build additions on it. Considerable construction work is now going on at the plant and other extensions are planned for the near future.

struction work is now going on at the plant and other extensions are planned for the near future.

C. W. McKone, superintendent of the plant since last November, has been made general superintendent, and H. R. Platt, formerly of the Batavia Rubber Co., has been made superintendent of the tire and tube department.

#### Dort Increases Capital \$1,000,000

FLINT, MICH., Feb. 6—The Dort Motor Co. has increased its capital from \$500,000 to \$1,500,000, of which \$918,000 has been issued and is paid up. The increase was subscribed by stockholders.

#### \$1,000,000 Plant for Diamond T

CHICAGO, Feb. 7—The Diamond T Motor Co., builder of motor trucks, is negotiating for the lease, with option of purchase of a \$1,000,000 factory to be erected on Kilbourne Avenue, this city.

#### Three Tire Companies to Build

CLEVELAND, Feb. 2—W. C. Owen & Co., engineers, have practically completed the new building of the Pearce Tire & Rubber Co., Ashtabula, Ohio, and are in the market for equipment for a 300-tire plant.

The same engineers have awarded the general contract for the first unit of the new plant of the East Palestine Rubber Co. to a building concern. This plant will have a capacity of 300 tires a day.

Plans and specifications have also been prepared by this firm for a new 400-tires-a-day factory of reinforced concrete for the A. L. A. Tire Co., and is preparing plans and specifications for remodeling the old plant of the Sycamore Tire Co., and an addition to the present building of the Boone Tire & Rubber Co., Sycamore, Ill.

## Kelly - Springfield Tire Earns 38.9%

1916 Income, \$2,117,314, Equal to 38.9% On Common—Gross Is \$3,464,459

NEW YORK, Feb. 1—The Kelly-Springfield Tire Co. in 1916 earned \$2,117,314, equal to 38.9 per cent on the \$4,907,200 common stock, after deducting \$215,598 dividends on the preferred. This compares with \$1,706,744 in 1915, or 29.67 per cent on the \$4,834,600 common. Gross profit in 1916 amounted to \$3,464,459, as against \$2,880,080 in 1915.

The earnings for the year ending Dec. 31, 1916, are compared with the 3 previous years as follows:

	1916	1915	1914	1913
Gross profits .....	\$3,464,459	\$2,880,080	\$2,203,761	\$1,264,567
Operating expenses, etc.....	1,404,388	1,195,874	1,014,016	716,189
Net operating income .....	2,060,071	1,684,206	1,189,746	548,378
Other income .....	57,243	22,538	41,874	43,376
Total .....	2,117,314	1,706,744	2,31,620	591,754
Interest .....			16,476	32,210
Net income .....	2,117,314	1,706,744	1,215,144	559,544

## Car Makers To Aid Government

### Ford, Packard, Cadillac, U. S. Rubber and Goodrich Offer Factories for War

WASHINGTON, Feb. 7—President Wilson's answer to the German government carrying with it the possibility of war has been followed immediately by hundreds of industrial organizations offering their services to the country. The automobile manufacturers are in the front rank of the volunteers.

Henry Ford made a trip to Washington to offer the Ford Motor Co. plant for the government's use without profit, stating that the factories could turn out 1000 submarines and 3000 cars per day if necessary.

The Packard Motor Car Co. is ready to manufacture aeroplanes in whatever quantity needed. The Cadillac Motor Car Co. is willing to devote its entire organization to government uses. The United States Rubber Co. has offered its 47 factories' services to the federal authorities and the B. F. Goodrich Co. has made a similar offer of its resources.

The Du Pont Powder Co. and other munitions and steel factories of the country have volunteered. The Aero Club of America, the Wilmington Motor Show Assn. and other societies were among the first to indicate their willingness to serve.

#### Chandler's 1917 Contracts \$27,000,000

CLEVELAND, Feb. 2—The Chandler Motor Car Co. has closed contracts with its distributors totaling more than \$27,000,000 worth of cars for 1917. The company recently shipped 217 cars to one European agent. Within the last month large shipments have been made to Brazil, Denmark, Uruguay, New Zealand, Siam, Norway and China.

#### Big Order for Hayes Wheels

ST. JOHNS, MICH., Feb. 5—The Hayes Motor Truck Wheel Co. has received an order for 20,000 wheels for the Maxwell Motor Car Co., Inc. These are to be shipped at the rate of 2000 a month.

#### Columbia Motors Will Build

DETROIT, Feb. 5—The Columbia Motors Co. will erect a large factory, to be completed within a year, to provide sufficient space for the business the company foresees in the future.

## 216,936 Farmers in N. W. Future Buyers —Over 62,000 in Minn. Are Owners

90,000 Sales Estimated for 1917—Excellent Crops Predicted—  
Montana Wants Cars—Bank Clearings Large—Minneapolis Show Bigger with Promise of Record Sales

MINNEAPOLIS, MINN., Feb. 3—Fertile fields for the sale of automobiles in 1917 are found in territory fed by factory branches and distributing agencies situated here. And what is more, the people are able to pay for the cars they buy. One big section of this ground ripe for tillage by automobile manufacturers and their selling agencies is the farmer class. Just now it is the farmer that is most open for prospecting work. The latest automobile census goes to show that in the Northwest territory there are at least 216,936 farmers who have not yet fallen into line and become possessors of cars. This is aside from reorders and additional orders by the approximately equal number of farmers who already own automobiles.

### 90,000 Cars in 1917

The harvest is ripe, for even conservative branch managers and dealers in this city estimate that to these farmers and to other probable buyers there will go out in 1917 about 90,000 cars, variously estimated at an average cost of from \$765 to \$900 each. The first figure will give a valuation of \$70,000,000 business for the year, while the more liberal estimate is \$84,000,000, as compared with 80,000 cars in 1916 from this market.

Bankers are a unit in saying that this territory, which for sales purposes may include beside Minnesota, the two Dakotas, eastern Montana, western Wisconsin and northern Iowa, is in prosperous condition. Although the crop as a whole did not come up to the figures for the bumper harvest of 1915, the average price was higher.

Banking conditions at the Twin City center will reflect the situation throughout the ninth regional reserve bank territory. Population of Minneapolis is 363,454 and of St. Paul 247,232. These are Federal estimates. Bank clearings in Minneapolis for 1916 were \$1,669,874,000 and for the Twin Cities, \$2,254,865,100 as against \$2,003,460,332 the year previous.

Bank transactions in Minneapolis for 1916 were \$5,440,770,000. On this basis the St. Paul estimate, no record being kept, will be \$2,900,000,000, or total \$8,340,000,000. Aggregate deposits in Minneapolis footed \$172,361,943 at the last call, compared with \$169,620,223 on Dec. 30, 1915. St. Paul figures were \$116,111,644 and \$105,143,027.

Chairman John H. Rich, of the Fed-

eral reserve bank, has shown gross earnings for the bank in the second annual report of \$238,000 and total resources of \$37,487,000, compared with \$99,600 and \$16,466,000 in 1915. He said: "Crop moving demands required a total of \$8,500,000, which was promptly put into circulation for handling grain. While the crop was far short of the 1915 crop the unusually high prices required a total issue for this purpose, which was \$500,000 in excess of the amount required to move the previous crop."

In general there may be gathered from this why automobile dealers as a class are expecting a tremendous year in sales, and why the increased figures for the tenth annual automobile show this week in the National Mazda Lamp building with its four floors and ten automobile display sections.

The floor space is 119,000 sq. ft. as against 65,000 in 1916. There are 238 exhibits, which is compared with 148 exhibits last year. In the automobile section there are seventy-two car exhibitors who show 300 cars. Last year there were 203 cars displayed by forty-eight dealers. In the accessory division are to be seventy-four exhibits as against forty-eight last year. Thirty-six commercial car exhibits are on the books compared with seven last year, and there are on show eight tractors; last year none. An additional interesting event is the use of 13,600 sq. ft. of floor space by sixty-four East Side manufacturers to demonstrate their business. All exhibits in the show are estimated at \$3,000,000 value.

### A Rich Territory

Farming, dairying, wool growing, livestock raising, manufacturing and iron mining may be considered among leading industries of the Minneapolis trade territory. They are all active. Laboring men have been receiving advanced wages, particularly in mining and manufacturing. This money is all going into circulation, due to high prices of living necessities. It is estimated more than \$3,500,000 a month is being paid in wages in the Butte and Anaconda district of Montana.

Select Minnesota creameries pay farmers in a year about \$30,000,000 for butter fat. Butter and milk add \$40,000,000. Livestock sold off the farms give the farmers \$30,000,000 up in a year. The hen division is estimated to

pay more than \$30,000,000. It was estimated by *Farm, Stock and Home* that the combined dairy and livestock receipts of Minnesota and the Dakotas are about \$200,000,000 a year. It figures estimated cash available at \$684,000,000, to which might be added the estimate by the Montana agricultural commissioner of \$94,936,090 crop value in 1916 for that State.

In the four principal States the total crop of wheat, corn, oats, barley, rye and flax amounted to 963,561,000 bushels by Government estimate valued at \$555,572,000.

### \$1,500,000 in Automobile Buildings

It is a sign of the times that more than \$1,500,000 is being spent in Minneapolis in automobile buildings in 1916 and to date. This includes the Overland \$500,000 distributing plant in the Midway at St. Paul and the proposed Maxwell plant on the Minneapolis side of the line to cost \$300,000, also the Overland retail plant in Minneapolis costing \$150,000. To this might be added the new plant of the Twin City Four Wheel Drive Co. near the Overland distributing building in St. Paul, costing about \$250,000. In branch and retail agency buildings about \$450,000 has been spent since the show a year ago.

Several new car, tire and truck agencies have entered the field. The Kelly-Springfield enlarged its agency to a branch. The Stewart-Warner Speedometer Co. opened a branch, also the Imperial Auto Supply Co. The Ahlberg Bearing Co. opened a branch and the Chalmers company. A million dollar company was formed to make the Ware truck in Minneapolis, the Four Wheel Drive Mfg. Co., and this bought the W. S. Nott Co. factory for building motor fire engines. The Twin City Four Wheel Drive Co. nearly doubled the size of a plant it opened early in the year.

At least twenty-five more companies were formed for automobile and accessory business, with a total authorized capitalization of \$1,250,000.

Summing up the trade possibilities, the big hope of the manufacturer in the four Northwestern States is the farmer. This is demonstrated strongly in the avidity with which automobiles are snapped up in Montana by the farmers and grazers. The automobile has become an economic necessity. It is shown conclusively by the fact that out of 155,000 farmers in Minnesota more than 62,000 own automobiles, and that half the farmers in these four States own cars.

### Cartercar and Duplex-Power Dissolve

LANSING, MICH., Feb. 3—The Cartercar Co., incorporated for \$350,000, and the Duplex-Power Car Co., incorporated for \$100,000, have been dissolved.

## Belmore Light Four and Six

### Company To Build Series in Open and Closed Body Types—Colors Optional

TOLEDO, Feb. 6—The Belmont Motor Car Co., recently organized for \$125,000, as told in an earlier issue of THE AUTOMOBILE, has completed its plans, and will build a series of light cars of both four and six cylinders. The line will consist of a five-passenger Riveria model touring, four-passenger Chevy Chase model club, two-passenger Daytona racy roadster. In addition, there will be a touring sedan, coupé and all weather top in the closed type. There will be no standard color, each purchaser having his choice of a series of color combinations.

#### Dayton Motor Truck Co. Formed

DAYTON, OHIO, Feb. 2—J. M. Dunwoodie, B. S. Murphy and other local business men have purchased the plant of the Durable Dayton Truck Co., this city, and have formed the Dayton Motor Truck Co. to resume operations at this plant. The company will have a capital of \$50,000 and will manufacture both worm and chain drive motor trucks of from 2 to 7½ tons capacity. Mr. Dunwoodie, who was formerly sales manager of the Stoddard Dayton company, has put the foreign business in the hands of Melchion, Armstrong & Dessau, New York.

#### Stewart-Warner Charges Sparton and Heco Systems Infringe

CHICAGO, Feb. 7—Suits against the Sparks-Withington Co., Jackson, Mich., and against the Heinze Electric Co., Lowell, Mass., were filed by the Stewart-Warner Speedometer Corp. in the United States district court, Chicago, Feb. 2. The suits claim violation of patents covering vacuum tank system of gasoline feed to carbureter. Stewart-Warner states that any vacuum system is an infringement of Webb Jay patents and will be prosecuted.

#### Double Shift for Reflex Ignition

CLEVELAND, Feb. 5—The Reflex Ignition Co., of this city, because of the increasing pressure of business is forced to adopt the double shift in its working staff. Beginning Feb. 15 the company announces it will employ a night force of 25 men in addition to its day payroll of 30 men.

Two new styles of product are announced by the company officials as just placed on the market. The first is style No. 21, an ignition especially adapted

for foreign make cars. The other new style is known as the Diamond Reflex, which is a large type plug particularly serviceable for heavy duty motors and racing cars. Both these new ignition styles sell for \$1.25 each.

The production of the Reflex Ignition Co. is announced as double that of last year. In 1916 the company turned out 500,000 ignitions and this year the output will reach 1,000,000. This has necessitated the night working force.

#### Indian Rubber Co. Buys Land

AKRON, Feb. 5—The Indian Rubber Co., a recent concern in this city, has purchased 13 acres of land at Mogadore and will spend \$100,000 for buildings and equipment. The company is capitalized for \$125,000. J. M. Alderfer, J. K. Williams and R. M. Pillmore are chiefly interested.

#### Louisville Maker for Kalamazoo

KALAMAZOO, MICH., Feb. 5—A manufacturer of automobiles, making 1500 cars yearly at prices ranging between \$1,800 and \$3,000, will soon move to this city from the South, to open a plant here. The maker has refused to divulge his name, but rumors state that it is a company now doing business in Louisville, Ky.

#### Dale Body Co. Formed

FOSTORIA, OHIO, Feb. 3—As was foretold by THE AUTOMOBILE, the Dale Body Co. has been formed as a subsidiary to the Allen Motor Car Co. It is a part of the community the company is building by adding factories. Other organizations will be formed in the near future.

#### Jay Resigns as Maxwell V.-P.

DETROIT, Feb. 7—John C. Jay, Jr., vice-president of the Maxwell Motor Co. has resigned. Mr. Jay recently resigned as chairman of the board of directors to become vice-president. He was chairman of the board for more than a year, James C. Brady recently succeeding him.

#### Olympian Buys Cartercar Factory

PONTIAC, MICH., Feb. 7—Olympian Motor Co. has bought the old Cartercar factory and 15 acres of land for expansion purposes.

#### Brisk-Blast Mfg. Co. at Monroe

MONROE, MICH., Feb. 2—The Brisk-Blast Mfg. Co., St. Louis, Mo., will move its plant and seventy-five of its workers to this city in the near future. The company is capitalized for \$200,000 and manufactures such accessories as tire pumps, grease guns and jacks.

## First Pull-More Factory Ready

### \$1,000,000 Company to Manufacture Trucks by Mar. 1 —100 a Month by June

PITTSBURGH, PA., Feb. 1—The new plant of the Pull-More Motor Truck Co., New Castle, Pa., is fast nearing completion. It is planned to begin manufacture by March 1, and to produce twenty-five Pull-More trucks during April. It is expected that the production will be increased to at least 100 vehicles per month by June 1.

The Pull-More Motor Truck Co., is a new \$1,000,000 concern with the following officers: E. M. S. Young, formerly vice-president of the Standard Gage Steel Co., Beaver Falls, Pa., president and general manager; Col. H. P. Bope, first vice-president and general sales manager of the Carnegie Steel Co., vice-president; Kenneth R. Cunningham, secretary and treasurer; J. M. Richards, works manager, H. H. Marker, chief engineer and R. C. Spohn, sales manager.

Pull-More trucks will be manufactured in one model of 3 tons capacity and will sell at about \$3,400 in the chassis. The vehicle has an unusual power plant assembly which drives to the front wheels and the upper half of which may be revolved, together with the complete cab, about hinges on one side. This exposes the crankshaft and crankpin connecting-rod bearings, the clutch, gearset and differential, so that inspection and repair of these parts may be made in much less time than is usually the case in the truck of conventional design. The power plant and the front wheels are in a unit by themselves and connected with the usual body and rear wheels by means of a special reach and drawbar attached to the front axle. The front end is also provided with a set of hinged auxiliary wheels which may be lowered when it is desired to disconnect the loaded body and move to a new position to connect up a second loaded rear end.

#### Brazil Co. to Build Front-Drive Trucks

INDIANAPOLIS, IND., Feb. 4—The Brazil Motors Co., of Brazil, Ind., just incorporated with a capitalization of \$150,000, has purchased the plant of the Brazil Fence Co., and will engage in the near future in the manufacture of a front-drive motor truck.

#### Harroun Makes Contract with Timken

DETROIT, Feb. 5—The Harroun Motor Corp. and the Timken Roller-Bearing Co. have closed a contract for bearings for Harroun cars.



# No Standard Roller Reorganization

## Creditors Asked To Take 60 Per Cent—Reorganization Plan Falls Through

PHILADELPHIA, Feb. 3—No reorganization will be made of the Standard Roller Bearing Co., and the creditors of the company have been asked to settle for 60 per cent of the face value of their claims. The reason for the failure of the reorganization plan, as outlined in THE AUTOMOBILE for Feb. 1, is that it was not possible to acquire satisfactory title to certain patent licenses held by the old company.

The reorganization committee has secured a proposal to buy all the property at a judicial sale and to pay therefor an amount equivalent to 60 per cent of the face value of all the claims against the company, exclusive of interest, as such claims may be audited and allowed by the United States district court.

The conditions attending this sale are that 90 per cent of the creditors agree to it, that the sale be assented to by the stockholders' committee and the stock they represent, that the property be actually transferred by Feb. 27, 1917, and that the amount of the claims does not exceed \$1,450,000.

The creditors will receive payment in cash, minus their pro rata share of the expenses, disbursements, and compensation of the reorganization committee, which shall not exceed 2 per cent of the claims.

The committee which has notified the creditors of the company of this move consists of Joseph Wayne, Jr., chairman; Harold Stanley, James P. Lee, Herbert Du Puy, Charles T. Taylor. Franklyn J. Griesbeck is secretary of the creditors' committee; and the counsel is the firm of Nicoll, Anable, Lindsay & Fuller.

### Ford Gives Big Steel Order

DETROIT, Feb. 5—The Ford Motor Co. has contracted for 20,000 tons of fabricated steel with the American Bridge Co.

for a manufacturing and assembling plant to be located at Cork, Ireland, to serve British trade, and has closed contracts for about 200,000 tons of various materials to be furnished by the United States Steel Corp. mills and to be delivered by the middle of next year. This material includes sheets, bars, tubes, wire and other products, and is expected to cover the company's manufacturing program in the United States.

### Metal and Rubber Prices Higher

NEW YORK, Feb. 7—Germany's threat of unrestricted naval warfare has advanced crude rubber about 10 cents a pound. Ceylon first latex crepe, the principal ceylon grade, sold Friday as high as 90 cents a pound, compared with 75 cents the day before. Three months ago crude rubber was but 60 cents a pound. Para has risen to 82 cents a pound, a gain of 7½ cents.

The copper market is quiet, though prices are higher. Little metal is being offered and prices are naturally higher. Both electrolytic and lake grades went up 1½ cents a pound to 34. Lead jumped to a new mark on Monday, when it reached \$9.50 per 100 lb., having risen \$1 over night. Tin rose to \$58 per 100 lb. from \$45.75.

### Gasoline Prices Advance

LOUISVILLE, KY., Feb. 1—The Standard Oil Co., of Kentucky has advanced gasoline 1 cent a gallon. Tank wagon prices are now 22 cents, and garage prices, 21 cents.

### Tulsa Four Automobile Corp. Formed

TULSA, OKLA., Feb. 2—The Tulsa Four Automobile Corp., this city, has been formed to build the Tulsa Four. The company has opened offices in Muskogee, Okla. The factory and general offices will be in this city. The new car has been on exhibition in this city for some time.

The corporation is backed by local men. T. J. Hartman is president; J. O. Mitchell is vice-president; M. E. Carr is treasurer; and G. E. Darland, secretary and general manager.

# Federal Truck Stock Increase

## Vote on 100 Per Cent Stock Dividend and \$1,500,000 Capital Increase Feb. 13

DETROIT, Feb. 6—The Federal Motor Truck Co. will hold a special meeting of stockholders on Feb. 13 and will vote on the recommendation that the capital be increased from \$500,000 to \$2,000,000, and that a 100 per cent stock dividend be issued to shareholders through the transfer of \$500,000 from surplus to capital account. The remaining \$1,000,000 of new stock, par value \$10, is to be retained in the company's treasury for future requirements.

During 1916 the company distributed 40 per cent in cash dividends, paying quarterly a regular dividend of 5 per cent and an extra dividend of 5 per cent.

The Federal company was incorporated in 1910 at \$100,000, which was increased to \$200,000 in 1912 by payment of a 100 per cent stock dividend, and to \$500,000 in 1915 by a stock dividend of 150 per cent.

### Tanner Heads Union Truck

BAY CITY, MICH., Jan. 30—The Union Truck Co., of this city, held its first annual meeting last week and re-elected the original directors as follows: W. Foss, J. R. Tanner, H. E. Buck, C. B. Chatfield, W. Boutell, H. P. Woodworth and L. W. Hine. Officers elected were J. R. Tanner, president; G. Beaulier, treasurer, L. W. Hine, secretary and H. P. Woodworth, general manager.

The business for the first year was considered very satisfactory. The company is now establishing agencies throughout the country.

### Titan Tire & Rubber Co. Incorporated

BATAVIA, N. Y., Feb. 7—The Titan Tire & Rubber Co. of this place has been incorporated to manufacture tires and rubber goods with a capital stock of \$1,200,000. The incorporators are H. D. Newman and J. J. Gray of New York; and J. Gerald of Coytesville, N. J.

### 15% Cash Dividend by F. W. D.

CLINTONVILLE, WIS., Feb. 3—The Four Wheel Drive Automobile Co., this city, at its annual meeting this week authorized a cash dividend of 15 per cent and a stock dividend of 100 per cent on a capital stock of \$500,000. This will increase the capitalization to \$1,000,000. The distribution is approximately equal to that made at the annual meeting of 1916, when a stock dividend of

## Daily Market Reports for the Past Week

Material	Tues.	Wed.	Thurs.	Fri.	Sat.	Mon.	Week's Changes
Aluminum, lb.	.58	.58	.58	.58	.58	.58	...
Antimony, lb.	.24	.25	.25	.25	.25	.25	+ .01
Bessemer Steel, ton	65.00	65.00	65.00	65.00	65.00	65.00	...
Copper, Elec., lb.	.32½	.32½	.32	.32	.32	.34	...
Copper, Lake, lb.	.32½	.32½	.32	.32	.32	.34	...
Cottonseed Oil, bbl.	12.55	12.60	12.18	12.30	12.15	12.60	+ .05
Fish Oil, Menhaden, Brown, gal.	.74	.74	.74	.74	.74	.74	...
Gasoline, Auto, bbl.	.23	.23	.23	.23	.23	.23	...
Lard Oil, prime, gal.	1.35	1.35	1.40	1.40	1.40	1.40	+ .05
Lead, 100 lbs.	8.40	8.50	8.00	8.50	8.50	9.50	+1.10
Linseed Oil, gal.	.95	.95	.94	.94	.94	.94	...
Open-Hearth Steel, ton.	65.00	65.00	65.00	65.00	65.00	65.00	...
Petroleum, bbl., Kan., crude.	1.70	1.70	1.70	1.70	1.70	1.70	...
Petroleum, bbl., Pa., crude.	3.05	3.05	3.05	3.05	3.05	3.05	...
Rapeseed Oil, refined, gal.	1.00	1.00	1.00	1.00	1.00	1.00	...
Rubber, Fine Up-River, Para, lb.	.75½	.75½	.78	.81	.81	.82	+ .07½
Rubber, Ceylon, First Latex, lb.	.75	.75	.75	.84	.84	.85	+ .10
Sulphuric Acid, 60 Baume, gal.	1.00	1.00	1.00	1.00	1.00	1.00	...
Tin, 100 lb.	45.75	45.75	50.00	52.00	52.00	58.00	...
Tire Scrap, lb.	.06¼	.06¼	.06¼	.06¼	.06¼	.06¼	...

100 per cent and a cash dividend of 30 per cent on a capitalization of \$250,000 was authorized. The company has more than doubled its factory facilities during the past year and still is engaged in making extensions. The report of President Olen stated that if no more orders were accepted after Jan. 1, 1917, the factory would be fully occupied for more than 6 months. All of the officers were re-elected, as follows: President, W. A. Olen; vice-president, D. J. Rohrer; secretary, Frank Gause; treasurer, D. J. Rohrer.

**Lang to Manufacture Bodies**

CLEVELAND, Feb. 3—E. J. Lang, formerly retail sales manager of the Baker R. & L. Co., and son of Charles E. J. Lang, founder of the Rauch & Lang Carriage Co., has resigned, effective Feb. 15, and will go into business for himself, manufacturing automobile bodies. Mr. Lang has been with the Baker R. & L. Co. for 12 years.

**Boynton Is Packard Purchasing Manager**

DETROIT, Feb. 7—F. W. Boynton has been appointed purchasing manager of the Packard company. He has been with the concern for 9 years. R. M. Anderson has been named as research engineer with Frank Wahl as his assistant.

**Dividend Declared**

Mitchell Motors Co., second quarterly of \$1.50 a share, payable Feb. 24 to stock of record Feb. 10.

**Upward Trend in Stock Prices**

**Automobile Shares Rise Sympathetically with War Brides on Bull Movement**

NEW YORK, Feb. 7—Automobile and accessory issues have risen in price the last few days in general sympathy with the war brides. At the present time the market is in a peculiar position. The if factor makes possible either a bull or bear movement. The bulls have had the upper hand since Monday, and prices have generally risen.

Up to Monday, automobile and accessory prices were, on the whole, much lower than the week before. Tire issues were weak and motor stocks were under pressure. Yesterday, however, the whole list was strong. Chandler closed 2½ points higher, at 97½; General Motors reached 108; and Maxwell, Studebaker and White were strong, with substantial gains.

Pierce-Arrow rose 5½ points to 51½; United Motors was ¾ point higher, quoting at 39¼.

**Smith Truck Increasing Shipments**

CHICAGO, Feb. 2—During the first 16 days of January, the Smith Motor Truck Corp. shipped 555 attachments. It is expected that the total for the month will exceed 1,400. Operations in the closing months of 1916 were affected by the restriction of production on the part of

automobile makers on account of the shortage in freight cars.

Contracts for 1917 by the Smith Motor Truck Corp. already received from agents aggregate 15,000. Shipments in December were 676 attachments; in November 697, in October 836, in September 679; and in August 1,152.

**Ford Surplus \$120,000,000**

DETROIT, Feb. 5—The Ford Motor Co. had a surplus on Jan. 18 of \$120,000,356 as compared with \$111,960,907 July 31, 1916, and \$59,135,771 July 31, 1915. Assets were \$137,547,038.

The tabulated statement follows:

ASSETS		
	1916	1915
Real estate.....	\$ 26,739,261	\$17,208,081
Machinery .....	12,445,377	11,863,548
Material .....	45,297,639	19,982,355
Cash .....	53,064,760	32,644,676
Patents .....	.....	62,622
<b>Total .....</b>	<b>\$137,547,037</b>	<b>\$81,761,282</b>
LIABILITIES		
Capital stock.....	\$ 2,000,000	\$ 2,000,000
Accounts payable.....	15,546,681	5,694,021
Reserves .....	.....	3,446,260
Floating debt.....	.....	4,964,788
Surplus .....	120,000,356	65,656,213

**Pa. Railroad Buys Paige Plant?**

DETROIT, Feb. 7—It is reported that the Pennsylvania Railroad has purchased the plant of the Paige Motor Car Co. which Paige leases, and the latter has bought 51 acres of land on which a new plant will be erected.

**100% Dividend for Hydraulic Steel**

CLEVELAND, Feb. 6—The directors of the Hydraulic Pressed Steel Co., this city, are considering a proposition to declare a stock dividend of over 100 per cent on

**Automobile Securities Quotations on the New York and Detroit Exchanges**

	Bid	Asked	Net Ch'ge
Ajax Rubber Co.....	68½	70	-6
J. I. Case T. M. Co. pfd.....	83	88	-2
Chalmers Motor Co. com.....	30	34	-2
Chalmers Motor Co. pfd.....	..	..	..
*Chandler Motor Car Co.....	92½	100	-6½
Chevrolet Motor Co.....	98	103	-2
Fisher Body Corp com.....	37	40	..
Fisher Body Corp. pfd.....	93	97	..
Fisk Rubber Co. com.....	75	85	..
Fisk Rubber Co. 1st pfd.....	104	108	-6
Fisk Rubber Co. 2d pfd.....	80	100	-10
Firestone Tire & Rubber Co. com.....	140	144	-4
Firestone Tire & Rubber Co. pfd.....	108	109	..
*General Motors Co. com.....	106½	108	-7¼
*General Motors Co. pfd.....	..	..	..
*B. F. Goodrich Co. com.....	54¾	55	-4¾
*B. F. Goodrich Co. pfd.....	109½	113	-1½
Goodyear Tire & Rubber Co. com.....	270	275	-7
Goodyear Tire & Rubber Co. pfd.....	107	108	-½
Grant Motor Car Corp.....	6	8	-1
Hupp Motor Car Corp. com.....	4	5	-1
Hupp Motor Car Corp. pfd.....	..	..	..
International Motor Co. com.....	16	20	+1
International Motor Co. 1st pfd.....	65	75	..
International Motor Co. 2d pfd.....	25	35	..
*Kelly-Springfield Tire Co. com.....	53	54	-5½
*Kelly-Springfield Tire Co. 1st pfd.....	90	92	..
*Lee Rubber & Tire Corp.....	22½	23	-1½
*Maxwell Motor Co. com.....	51	51½	-3¼
*Maxwell Motor Co. 1st pfd.....	65¾	68	-6¾
*Maxwell Motor Co. 2d pfd.....	34	36	-4
Miller Rubber Co. com.....	255	265	+1
Miller Rubber Co. pfd.....	105¾	106¾	..
Packard Motor Car Co. com.....	..	156	..
Packard Motor Car Co. pfd.....	..	102¼	..
Paige-Detroit Motor Car Co.....	38	39	-2¾
Peerless Truck & Motor Corp.....	16	18	..
Portage Rubber Co. com.....	166	172	..
Regal Motor Car Co. pfd.....	27	35	..
Reo Motor Car Co.....	34½	35	-3
Saxon Motor Car Corp.....	51	60	-12
Springfield Body Corp. com.....	70	90	-7
Springfield Body Corp. pfd.....	110	125	..

	Bid	Asked	Net Ch'ge
Standard Motor Construction Co.....	5	6	+½
†Stewart-Warner Speed. Corp. com.....	81½	82½	-17¾
*Studebaker Corp. com.....	..	..	..
*Studebaker Corp. pfd.....	80	..	..
Swinehart Tire & Rubber Co.....	80	85	-4
United Motors Corp.....	39	39½	-2¾
*U. S. Rubber Co. com.....	55¼	55½	-4½
*U. S. Rubber Co. pfd.....	105	109	-4¼
White Motor Co.....	47½	48	-3½
*Willys-Overland Co. com.....	31¾	32	-3¼
*Willys-Overland Co. pfd.....	95	98	-2¼

\*At close Feb. 5, 1917. Listed New York Stock Exchange. †Ex-div.

**OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE ACTIVE STOCKS**

	Bid	Asked	Net Ch'ge
Auto Body Co.....	..	35	..
Chalmers Motor Co. com.....	..	..	..
Chalmers Motor Co. pfd.....	..	..	..
Continental Motor Co. com., new.....	8½	9¼	-30
Continental Motor Co. pfd., new.....	97½	..	-1
Ford Motor Co. of Canada.....	..	225	..
General Motors Co. com.....	..	..	..
General Motors Co. pfd.....	..	..	..
Maxwell Motor Co. com.....	49	52	-5
Maxwell Motor Co. 1st pfd.....	..	..	..
Maxwell Motor Co. 2d pfd.....	..	..	..
Packard Motor Car Co. com.....	..	155	..
Packard Motor Car Co. pfd.....	..	101¾	..
Paige-Detroit Motor Car Co.....	..	39¼	..
W. K. Prudden Co.....	..	49	..
Reo Motor Car Co.....	36	..	-1½
Studebaker Corp. com.....	99	102	-7
Studebaker Corp. pfd.....	..	..	..
C. M. Hall Lamp Co.....	..	..	..

**INACTIVE STOCKS**

	Bid	Asked	Net Ch'ge
Atlas Drop Forge Co.....	38	..	+1
Kelsey Wheel Co.....	50	54	..
Regal Motor Car Co. pfd.....	27	35	..

the common and to issue additional common stock in connection with the recent acquisition of the Cleveland Welding Mfg. Co.

A deal has been pending which, if carried through, would have resulted in the Rockefeller interests obtaining a big control in the Hydraulic company, but the fact that the stock dividend is now under consideration indicates that the Rockefeller transaction has not been closed.

#### Two New Silvex Products

SOUTH BETHLEHEM, PA., Feb. 6—The Silvex Co., this city, maker of Bethlehem 5-point spark plugs, will soon announce two new automobile specialties. The first of these is a low price one-point spark plug, which is now coming through in large quantities. Deliveries will soon begin. The second consists of a pneumatic shock absorber made to sell at a popular price and specially designed for Ford cars. An important feature of this latter is that air is used instead of springs.

#### York Show Sells 100 Cars

YORK, PA., Feb. 7—A remarkably heavy sale of cars in proportion to the attendance was the feature of the York show. The exhibitors disposed of 100 automobiles to 15,000 visitors, or a car to one person out of each 150 at the show. The industrial growth of this section, together with the fact that it is a rich grain section, leads the dealers to look forward to 2500 sales within the coming year. A report of the industrial and agricultural wealth of this territory will appear in an early issue.

#### Reorganize K. D. Carburetor Co.

CLEVELAND, Feb. 7—The K. D. Carburetor Co. has been reorganized with a capital stock increase of \$275,000. It has purchased the plant of the Atlas Bolt & Screw Co. and will move into the new quarters as soon as the present tenants have vacated.

#### Four New Bearings Service Branches

NEW YORK, Feb. 6—The Bearings Service Co., with general offices in Detroit, and branches in all the principal cities, will open four new branches this spring. These will be at Philadelphia, Rochester, N. Y., Cleveland and Indianapolis. At present it has eleven branches in New York, Chicago, Detroit, Boston, Kansas City, Minneapolis, Seattle, Atlanta, Dallas, San Francisco and Los Angeles. This company was organized last year by the Timken, Hyatt and New Departure bearings companies to handle their service to the customer. The service is direct from the branch.

## Independent Truck at \$1,100

### Company Will Open Plant in Davenport—To Make All Parts Except Axles

DAVENPORT, IA., Feb. 3—The Independent Auto Truck Co. will open a plant in this city to build a truck selling at \$1,100. The company will be incorporated for \$50,000, the incorporators being Charles Zoller and E. August. Mr. Zoller is president.

Three buildings, comprising the southwest portion of the Independent Brewing & Malting Co., have been converted into a manufacturing plant. About 24,000 sq. ft. of floorspace will be utilized by the company. With the exception of the axles all the parts will be manufactured at the local plant.

#### New Factory for American Truck

DETROIT, Feb. 7—The American Motor Truck Co., incorporated for \$600,000, will begin work within 30 days on a plant in southwestern Detroit on the Michigan Central tracks.

#### Wilmington Show Attendance 60,000

WILMINGTON, DEL., Feb. 7—Attendance at the Wilmington show held in the Hotel Du Pont last week exceeded all expectations by reaching the 60,000 mark. Dealers paid \$105 toward the end of the week for unallotted space which had been priced at \$35 on the first day. There were thirty-one exhibitors, and at least

fifty cars were sold. The munitions, leather, fiber, and farming interests of the territory have been extremely prosperous in the past year. A detailed account of the resources of this region will be published in an early issue of THE AUTOMOBILE.

#### U. S. Chamber Elects Officers

WASHINGTON, D. C., Feb. 3—R. Goodwyn Rhett of Charleston, S. C., has been re-elected president of the Chamber of Commerce of the United States, following the fifth annual meeting of that organization held in Washington last week.

Other officers of the National Chamber have been re-elected as follows: Harry A. Wheeler of Chicago, John H. Fahey of Boston, and A. B. Farquhar of York, Pa., honorary vice-presidents; Samuel McRoberts of New York City, vice-president; and Joseph H. Defrees of Chicago, vice-president and also chairman of the executive committee.

John Joy Edson of Washington has been re-elected treasurer. The newly elected officers are: Hon. Charles Nagel of St. Louis, honorary vice-president, and Willis Booth of Los Angeles, vice-president.

James Couzens, formerly vice-president, treasurer and general manager of the Ford Motor Co., Detroit, was re-elected a director of the chamber, as were R. T. Cunningham, Fairmont, W. Va.; R. G. Rhett, Charleston, S. C.; L. C. Boyd, Indianapolis; E. T. Meredith, Des Moines; Thos. B. Stearns, Denver; and A. I. Esberg, San Francisco. New members of the board are: F. H. Johnston, New Britain, Conn.; Lewis E. Pierson, New York; H. A. Black, Galveston, Tex.; C. H. Howard, St. Louis; and J. E. Chilberg, Seattle.

#### To Wind Up Streator Affairs

STREATOR, ILL., Feb. 2—Creditors of the defunct Streator Motor Car Co. have received word from E. U. Henry, referee in bankruptcy, that a meeting of the creditors will be held in Peoria, Ill., on Feb. 10, to wind up the affairs of the concern. The sum of \$9,166 is on hand.

#### Motor Castings Co. in Receivers' Hands

DETROIT, Feb. 7—The Motor Castings Co. has been placed in receivers' hands. Assets are \$225,000, and liabilities \$100,000. The company manufactures cylinder castings. The company may continue operations pending reorganization.

#### National Show Mgrs. Assn. Organization Completed

CHICAGO, Feb. 2—The organization of the National Assn. of Automobile Show Managers has been completed. At a luncheon in this city last week, about thirty men attended and made the organization permanent. Much data is to be



PERCY MARTIN

Mr. Martin, an American engineer, has been appointed engine controller of the British Empire and a member of the Imperial Air Board

collected and an effort made to establish a standard of show management. An exchange of ideas will result in certain improvements in several of the remaining shows of this season. Membership is to be by associations, so that a city may still be represented should it change managers. Or, the president or some other association officer may represent that show at the meetings.

#### Appleby Heads Erd Motor Co.

SAGINAW, MICH., Feb. 5—The Erd Motor Co. held its annual election last week and elected the following officers and directors: Officers—B. G. Appleby, president; J. G. Erd, vice-president; H. S. Erd, secretary; A. W. Seeley, treasurer and manager. The above officers and O. L. Dittmar, C. F. Beach, W. J. Passolt and R. Knapp compose the directors.

The company is employing seventy men and makes engines for tractor companies.

#### Wolverine Wants Factory Location

WAYNE, MICH., Feb. 7—The Wolverine Car & Tractor Co., whose temporary assembling plant is located here, is looking for a permanent factory location. William G. Wagenhals is president of the company.

#### Bikle, of Lycoming Foundry, Dead

WILLIAMSPORT, PA., Jan. 28—E. B. Bikle, assistant secretary and treasurer and office manager of the Lycoming Foundry & Machine Co., this city, died to-day. No successor will be appointed until the next meeting of the board of directors.

#### Wisconsin Motor Moves N. Y. Office

NEW YORK, Feb. 2—The local offices of the Wisconsin Motor Mfg. Co., Milwaukee, Wis., have been established at 21 Park Row. T. M. Fenner is Eastern factory representative.

#### A. A. A. Tests Osgood Lens

CHICAGO, Feb. 5—The Osgood lens, made by the Osgood Lens & Supply Co., this city, recently passed a test of the Contest Board of the American Automobile Assn. on control of the light from headlamps. The demonstration was made in a series of tests made on the local speedway.

A Hudson car equipped with regular lamps made by the C. M. Hall Lamp Co. was used, the light being projected on a screen 7 ft. high and 65 ft. long. At 50 ft. and 75 ft. distance the light beams cut the screen 25 in. from the roadway and were horizontally diffused 15 and 18 ft. respectively. At 150 ft. the light cut the screen 24 in. from the roadway and was diffused horizontally 35½ ft. At 250 ft. the height at which the light beams struck the screen was indeterminate, though the horizontal diffusion was 60 ft. A test to determine the total carrying power of the lenses shows the light capable of casting a shadow at 1800 ft.

## 1916 Racing Winners Banqueted

### Important Announcements for 1917 at Chicago Event—Speedways to Be Safer

CHICAGO, Feb. 1—Dario Resta and Johnny Aitken, 1916 racing champion and runner-up, respectively, were tonight crowned with the laurels coincident to their achievements in the realm of speed, the occasion being the banquet tendered in their honor by the American Automobile Assn. at the Chicago Automobile Club. After the award of the Bosch and Goodrich prize money and Bosch trophy to Resta, Aitken and Rickembacher, together with a diamond-set platinum fob to Resta from the American Automobile Assn., several important racing announcements were made for the coming year.

The Bosch Magneto Co. will offer a similar purse and cup to go to the winner of the championship of 1917 under the same conditions as in 1916.

The Hudson company will have five cars on the speedways this year, with Arthur Hill, former manager for Resta, as team manager. Mulford will be the star driver for the team, Billy Chandler will be in charge of the mechanical end, and Ira Vail also will drive. The other two drivers have not been decided upon.

James Allison announced that Indianapolis will go back to the 500-mile race this year. The Indianapolis management considers taking the Decoration Day classic to Cincinnati unless hotel managers in Indianapolis unanimously agree upon a program of normal hotel rates for race meet days.

Clifford Ireland gave his personal version of some angles of race management, although he said his remarks were not to be construed as coming from the contest board as a whole. He called attention to there having been fifteen men killed on the tracks and speedways last year.

"Only one speedway, in my opinion, is properly constructed," he declared. "Perhaps it is because the contest board is not properly represented that accidents occur. I believe most of the speedways try to live up to the rules, although some try to avoid the safety-first idea. If a representative of the contest board lives up to the board's instructions he goes up against a stone wall—he either jeopardizes the speedway investment by calling the race off or he is lax in his duties."

James Allison, head of the Indianapolis speedway, declared that the Indianapolis course was believed safe when it was built and that much money

has been spent in making it more safe each year. He said that the difference in the speed of present day racing cars as compared with that of a few years ago had caused the management to decide upon the building of a safety apron and wall on the back stretch of the Indianapolis course before next year.

He advocated a committee made up of some representative of the contest board, of the race drivers and of the speedway management, whose duty it would be to visit the track 30 days prior to the date of the race and point out any means thought necessary for making the track more safe. This would give the speedway management time to make the changes, and unless the changes were made as specified the sanction should be withdrawn. He did not favor withdrawing sanction unless the speedways were given sufficient time to make necessary changes.

#### A. A. A. Contest Board to Issue Racing Directory

NEW YORK, Feb. 3—The Contest Board of the American Automobile Assn. is publishing a directory of all racing events to date. This directory is on the press now and will be out around March 1. It is complete in every detail, covering the results of all trials, reliability contests, road and track events, and hill-climbs. It also includes all the Glidden tours and a complete summary of the 1916 speedway championship events. The new official standing records recognized by the A. A. A. contest board are also included.

#### Ohio Light Bill Passed by Senate

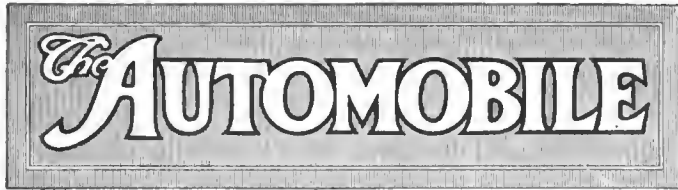
CLEVELAND, Feb. 6—The Terrill Bill requiring lights on all vehicles, both horse and motor propelled, has passed the State Senate at Columbus and is now pending in the House. The bill was drafted by the Ohio State Automobile Assn. It was introduced by Senator Virgil Terrill of Cleveland.

#### Dr. Lewis Goodyear Consulting Chemist

CLEVELAND, Feb. 3—Dr. Warren K. Lewis has been named consulting chemist by the Goodyear Tire & Rubber Co., Akron. Dr. Lewis is professor of chemical engineering at the Massachusetts Institute of Technology and is an expert on the chemistry of rubber processes.

#### Bennett with Service Motor

CHICAGO, Feb. 7—William H. Bennett has joined the advertising forces of the Service Motor Supply Co. He was formerly advertising manager of the Searchlight Co., Chicago, which has been consolidated with the Air Reduction Co. of New York.



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**Foreign Trade Foundations**

**B**ECAUSE the world's supply of gold has flowed so rapidly into our treasuries during the past 2 years, and because the stock of gold in Europe is correspondingly depleted is no reason why we should imagine those countries are correspondingly impoverished and we correspondingly enriched. Our present abnormally large gold supply is no assurance that our foreign trade must be great in the future. It is no assurance that we may hold what we have at present.

**Gold Must Be Used**

This gold is only of value in proportion as we use it, and in accordance with how we use it. If we so use it as to make it easier for foreign lands to trade with us, to buy those natural or manufactured products we have for sale, then our wealth as a nation and our position in foreign trade is correspondingly improved; but if, on the other hand, we worship it as so much yellow metal and ensconce ourselves behind its apparently impregnable ramparts, we are playing the ostrich game of burying our heads in the sands and our deeds will fall on our own shoulders.

The foreign countries after the war will only buy from us those goods they are in need of and can most conveniently buy from us on terms convenient to them and at times to meet their convenience. Our gold is not going to be a trade whip such as many imagine it is. The financial center of the world has

not been shifted across the ocean by the present transfer of securities and gold. Europe that originated world trade, that originated world finance, that originated world exchange, still holds the center. In spite of the enormous war those allied nations such as Great Britain, France and Italy are enjoying the greatest world trade in their history, and they are to-day and have been for 2 years laying plans for a more vigorous world trade drive.

**Ships, Co-Operation and Tariff**

Our masses of gold will stand us in poor stead unless we are ready to meet the experienced trading nations of the world on an equal foreign trade basis. At present we are not qualified to do this. Our greatest need is to-day to begin creating some of those great essentials that seem to-day to be the real necessary corner stones of foreign trade, a merchant marine, a bargaining tariff and legislation which will legalize co-operation of our manufacturers, and selling organizations in foreign trade. Each company can work its best individual plan for foreign trade, but all of their efforts will show much greater results if nationally we can stand back of them with this great trinity of export trade—ships, co-operation and tariff.

**Hidden Grease Cups**

**C**HASSIS lubrication is not as highly developed as engine lubrication. It is only necessary to stop to think how disastrous it would be for the average engine life if crankshaft lubrication were made as difficult as that of some of the chassis points, to realize this. It does not seem possible to say that a chassis is highly developed in which the driver, who is most often the owner, has to climb beneath the car every few hundred miles in order to secure proper lubrication.

Some of the chassis exhibited at the show this year had as many as from five to seven grease cups located directly in the center of the chassis at such points that they could not possibly be reached except by climbing under the car. Suppose such a car is driven for a few weeks over muddy and bad roads, is it not almost certain that the lubrication of these vital points is going to be neglected? Can any one look forward with pleasure to the duty of refilling these cups with grease and under the difficulties of a strained position, and an accumulation of dirt, of replacing the cup?

If the cup must be put under the car at the center of the chassis could not an opening be left above through the floor board for reaching it? A short pipe connection could readily be used to bring the cup to a point convenient for refilling through the bottom of the car. It is a question that is serious. Owner-drivers *will not*, as a class, give concealed and inaccessible grease cups the proper attention. Chauffeur-drivers, as a class, are not greatly ahead of the owners in this respect. It is up to the engineer to make chassis lubrication a study and to produce a scheme in which the inconvenience of the owner and driver will be brought to a minimum.

# How S. A. E. Could Help in War

## President Dunham Points Out Society's Industrial and Military Value—Highly Trained Body, Used to High-Pressure Work of Immense Assistance

**D**ETROIT, Feb. 6—George Dunham, president of the Society of Automotive Engineers, told a representative of THE AUTOMOBILE to-day what the society would do for the government in case of war. Mr. Dunham said that the society as an organization has in its membership the very men that would be needed in case matters came to a climax. He pointed out the great part in present-day warfare that the internal combustion engine is playing, not only at the actual front but throughout the great industrial areas necessary to maintain the fighting line.

Mr. Dunham stated that for every man at the front it is necessary to set seven others to work to support him. The man with the gun is only a small part of the organization of an army and the great work that is being done with the other parts of the unit is largely being accomplished with internal combustion engines.

To meet this requirement the S. A. E. has men who have made this particular science the study of their lives. Mr. Dunham stated that the organization as a whole is at the disposal of the government and that individually he had already had a number of offers of unlimited services to the government from different members of the society. These offers will be submitted to the government.

In the matter of industrial organization Mr. Dunham stated that the S. A. E. would be particularly valuable because it is made up of men who are accustomed to thinking

and acting quickly. The quick growth of the automobile industry which has involved numerous revisions of method in every department of the work has caused this. He stated that war is more or less of an industrial race and the help of an organization which has been actively engaged at maximum speed for a number of years could not but be valuable in a time of necessity.

### S. A. E.'s Part in War

Speaking of the particular fields in which the society would be particularly valuable, Mr. Dunham mentioned the commissary and signal corps departments with which co-operative work has been carried on for some time. In addition the manufacturing resources for munition making are almost unlimited. Coker F. Clarkson is in Washington at the present time and part of his visit is particularly concerned with ascertaining the directions in which the society could be of assistance. Secretary Daniels, of the navy, has frequently conferred with the officials of the organization on the part it could play in a scheme of national defense and has been particularly impressed with the great help that could be rendered in aeronautical work.

The automotive industry, Mr. Dunham showed, is essential on the sea, in the air and on land; and the Society of Automotive Engineers is ready and able to become a valuable aid in case of necessity.

## Automobile Engineers in Reserve Corps

**F**OLLOWING the tender of service long ago made the government by the Society of Automotive Engineers, and in pursuance of the society's co-operation with various government bureaus in the formulation of military truck, aeronautic and kindred standards, many S. A. E. members have applied for and some have received appointment as officers in the reserve corps of the War Department. In the potentially if not actually critical situation of world affairs involving immediately the United States, a general statement of the types of men desired by the government from civilian life now is of interest. Many applications are now at hand in Washington, but additional ones are wanted to meet all possible emergencies. It is not for the best interest of the government or individuals for the latter to enter the reserve service until they shall have decided that if necessity come they can conveniently and willingly serve to the end.

The object in organizing the Quartermaster Reserve Corps is to obtain high-class specialists, to serve according to their previous training and knowledge and be so prepared that in the event of the President calling for their services, they will be capable of rendering efficient service without further training. A reserve officer is appointed for a period of 5 years; must, so ordered, attend each year an army encampment for a period of 2 weeks; and present himself for active duty at the proper place in time of actual or threatened hostilities.

In listing suitable persons to be commissioned in army corps in connection with motor transportation, the members

of the Society of Automotive Engineers will naturally be drawn upon very largely. Men from this organization will have to be depended upon as technical advisers of the officer grade to supervise the operation on a large scale of motor truck companies and the requisite repair shops. A considerable number of men qualified as foremen in and superintendents of shops are needed by the army as truckmasters with motor companies. A large number of chauffeurs and mechanics must be listed. The S. A. E. members from their wide and intimate connection of the automobile industry will be able to provide from men employed by them or of whom they know, adequate lists of the last named four classes of men.

In general the S. A. E. members will serve as authorities in the design of engines, in metallurgy, electrical engineering, development of starting and lighting systems for aeronautic work, searchlight signalling, adaptation of wireless equipment to aeroplane use, mounting engines in aeroplanes, and conducting supply depots and parts service stations. Prompt movement of truck trains, without delay caused by a single breakdown, is essential in military transport.

Men desiring to be appointed officers in the reserve corps should make application to the War Department, Washington, addressed to the respective corps, whether it be the Aviation Section, the Quartermaster Corps, the Engineers or the Ordnance or other corps. Full information and necessary blanks will be furnished by the War Department. The data

wanted refer to previous service in the regular army, or volunteer forces of the United States, or organized militia of any state; education; experience; age. Letters of recommendation from three citizens, with address, are to be furnished.

### The Aeronautic Field

As broad a field as any for automobile engineers in the army is the aeronautic service. In addition to the activities mentioned above, inspectors are needed for aeroplanes and engines under order, as well as stock purchasers in general. Observation balloons, gas generating plants, equipment for balloon operation such as winches, are to be thoroughly developed and produced. Men are needed to work on the question of stresses in rigid dirigible airships; specialists in light, strong, alloyed metals.

Documentary evidence as to past work and character must be produced by applicants for positions with the Aviation Section. Severe physical examination is required at present of applicants as aviators. For other positions the respective work for which a man is suited is considered in the physical examination. Information as to place of physical examination is furnished upon application.

The pay and allowances of officers in the reserve corps

are the same as those of regular army officers of the same grade. The allowances include transportation, medical attendance and quarters.

There are over 100 government aeroplanes in flight service to-day, as compared with twelve a year ago. Five hundred will be in service, it is understood, at a relatively early date.

There are 50 rated military aviators to-day, in addition to 50 officer students at San Diego. There are 50 reserve corps aviators in various stages of advancement.

About 650 elementary licenses have been issued to aviators in this country since the beginning of the art. A goodly number of the men to whom these licenses were issued are not now available for service. About 70 expert licenses have been issued.

A great deal of training is necessary after a man receives his pilot's license before he can qualify for an expert's license. It takes 6 months to train a man holding an elementary license to become an expert.

The San Diego school specializes in the training of officer aviators. The schools in Mineola, L. I., and Chicago conduct the advance training of reserve corps fliers.

The essential temperamental characteristics of an aviator are mental alertness, decisiveness and good judgment; mechanical knowledge, particularly of combustion engines, is invaluable.

## S. A. E. Council Approves Standards Committee Draft

(Continued from page 309)

sponse. Automobile show week in New York is invariably overcrowded with banquets and other functions, whereas Chicago show week is rather lean on such performances. Chicago hotels have accommodations for banquets with attendance as high as 800, which is practically the same as New York. It would be possible to have a 1-day winter session in Chicago which might be attended by a great many who have not the opportunity of going to New York, but who are always present at the Chicago show.

A complete draft of the Standards Committee for 1917 follows:

The society has made several important changes for 1917 in the different divisions. Chas. M. Manly has become chairman of the Aeronautic Engine Division. The other members of this division consist of Henry Souther, H. M. Crane, F. S. Duesenberg, J. G. Vincent, Spencer Heath, Capt. V. E. Clark, G. C. Loening, C. B. King, and S. D. Walden.

F. G. Hughes is chairman of the Ball and Roller Bearings Division, the other members consisting of G. R. Bott, T. V. Buckwalter, C. H. Clement, F. M. Germane, B. D. Gray, F. J. Jarosch, R. S. Lane, C. W. McKinley, G. A. Ungar, and M. W. H. Wilson.

F. L. Morse is chairman of the Chain Division. There are five other members, as follows: W. J. Belcher, H. F. Funke, J. R. Cautley, J. C. Howe, and H. S. Pierce.

A Data Sheet Division of the Standards Committee has been re-established, with A. C. Bergman as chairman. The other members of this division will be announced later.

The Electrical Equipment Division will be continued with substantially the same membership as last year, including A. L. Riker, Joseph Bijur, Alex. Churchward, O. F. Conklin, Frank Conrad, W. A. Chryst, C. F. Gilchrist, D. M. Leece, T. L. Lee, A. D. T. Libby, and A. H. Timmerman.

The Electrical Vehicle Division will be continued, A. J. Slade retiring as chairman but continuing as a member of the division. The other members of the division will be A. S. Baldwin, E. P. Chalfont, J. H. Hertner, W. P. Kennedy, F. E. Queeney, E. J. Ross, Jr., and E. R. Whitney.

The Engine and Transmission Division will consist of the following members, though it is expected later that the list will be increased in size somewhat: W. T. Fishleigh, R. J. Broege, A. W. Copland, W. A. Frederick, L. C. Fuller, E. G. Gunn, H. L. Horning, A. F. Milbrath and H. C. Snow.

The Foreign Co-operation Division will consist of the following members: A. L. Clayden, chairman; W. H. Allen, C. C. Carlton, J. E. Hale, B. Maraini and H. W. Waite.

The name of the Headlamp Glare Division has been changed to the Lighting Division. The personnel is as follows: W. E. McKechnie, chairman; P. F. Bauder and A. L. McMurtry.

K. W. Zimmerschied will be chairman of the Iron and Steel Division with the following members: R. R. Abbott, W. B. Hurley, F. E. McCleary, G. L. Norris, J. H. Parker, C. F. W. Rys, H. J. Stagg, Jr., and H. G. Stoddard.

The Miscellaneous Division will consist of the following: E. H. Ehrman, chairman; Clarence Carson, C. S. Crawford, J. E. Diamond, W. A. Frederick, W. H. Knowles, Berne Nadall, H. H. Newsom, and E. E. Sweet.

K. W. Zimmerschied is chairman of the Nomenclature Division, the other members consisting of H. E. Coffin and A. Ludlow Clayden.

C. W. McKinley is chairman of the Springs Division, the other members being C. E. Clemens, W. C. Keys, R. L. Morgan, W. M. Newkirk.

A division to be called the Starting Battery Division has been established. This will be constituted of car designers and engineers, representing battery makers.

K. W. Zimmerschied is chairman of the Tire and Rim Division. The other members are as follows: W. H. Allen, E. K. Baker, C. C. Carlton, J. E. Hale, E. O. Heinsohn, J. C. Manternach, C. B. Whitelsey, J. E. Hulse and C. B. Williams.

H. D. Church is chairman of the Truck Standards Division. The other members are: B. B. Bachman, P. J. Batenburg, Wm. M. Britton, L. P. Kalb, W. T. Norton, Jr., A. L. Riker, W. R. Strickland, A. J. Scaife, G. W. Smith, F. A. Whitten and John Younger.

A Marine Division has been established. The members of this will be leading engineers engaged in the design and production of marine engines, hulls, reverse gears and propellers.

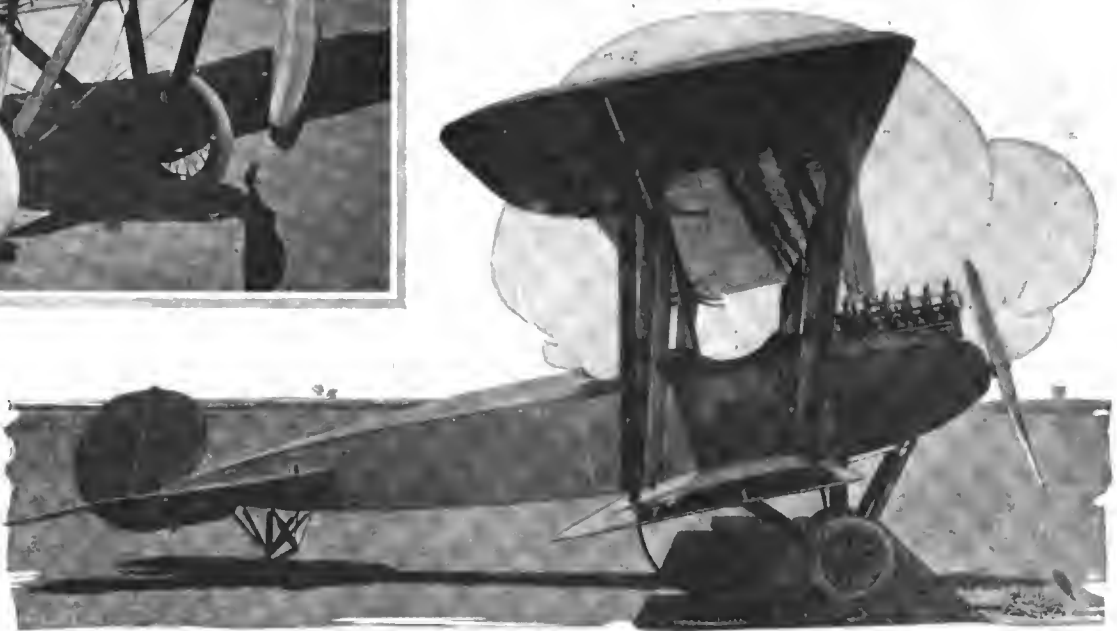
H. L. Horning will serve as chairman of a Tractor Division. The other members of this division will be announced at an early date.

# Hold First Aero Session

S. A. E. Expects Large Attendance at Aero Show Meeting—  
Finest Collection of Motors  
Ever Seen in Exhibition



The logical descendant of the original Wright aeroplane; the Wright-Martin biplane that will be at the aero show



**T**HAT there will be huge crowds at the first national aeronautic exhibition, which opens at the Grand Central Palace to-day, Feb. 8, is a foregone conclusion. More than ever so perhaps, as a result of the past week's international developments. But while the big crowd will be formed largely of the idly curious, the show will be one of the most interesting exhibitions that engineers have ever been able to see.

The aeroplane, and particularly the aeroplane engine, is the most recent triumph of engineering skill, and the exhibition about to open will contain a greater variety of up-to-date engines than have ever before been gathered together for public view. Amongst them a majority are testimony to the skill of men who had their training in automobile work, and by far the most impressive and also the biggest of these motors come in the automobile engineering category.

In Europe for a long time the idea persisted that the aviation engine needed to be something quite different from an automobile motor. It was thought that the high-speed type akin to the racing car engine could not be built so light for its power as some entirely original design; whence came the Gnome and a host of other engines. But since the war, when the aeroplane has been put to real work, it has transpired that the engine that is fundamentally a racing car motor, only larger and more expensively made, is giving far the best service.

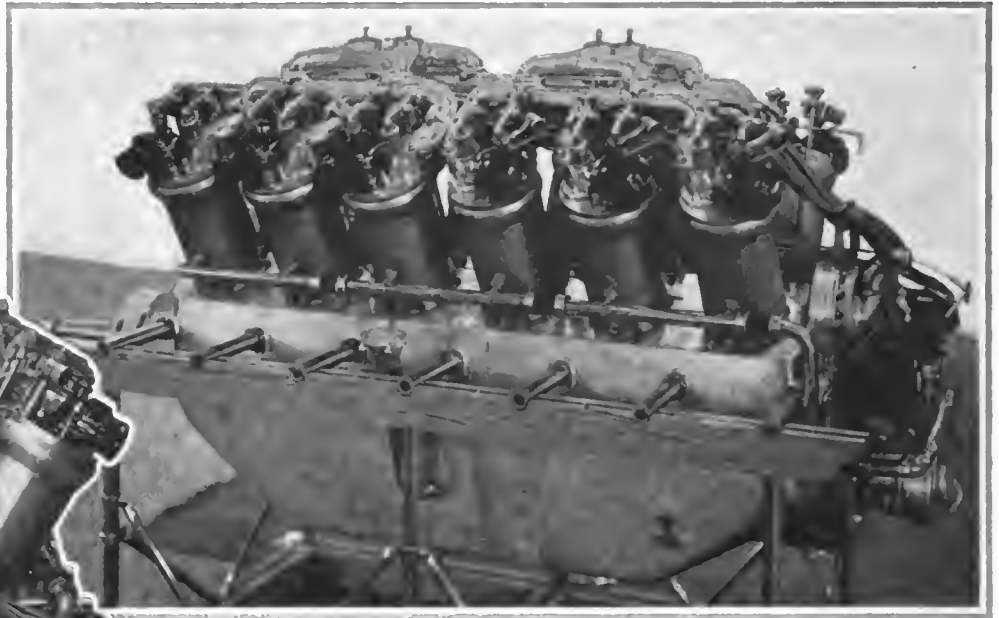
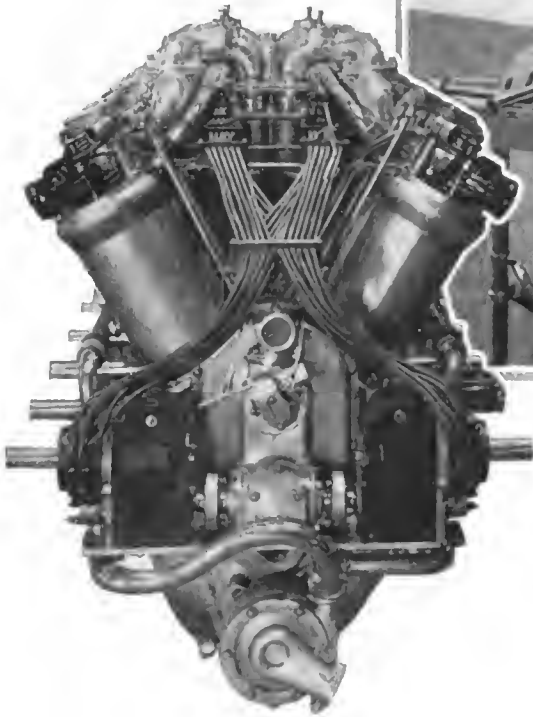
An unexpected event has been the demand for engines of such large size. Three years ago 120 hp. was large, to-day we have to multiply this figure by three to be able to call an engine big. Horsepowers between 200 and 300 are the rule, and the cry of the military and naval users is for still more power. There is something stupendous in the idea of a twelve with a bore of 5 in. and stroke of 6 or 7 in revolving at 2000 r.p.m. or more, and to produce such engines even with racing car construction as a basis has not been easy. The difficulty is increased greatly by the need for low weight; it is stated on good authority that the European governments will not now consider any engine that scales more than 3 lb. per horsepower exclusive of water, but inclusive of carbureters and ignition. A weight of 3½ lb. is thought passable, but anything greater than this is said to be altogether too great for consideration.

## Limit of Cylinder Size

One of the things the engineers have soon to settle is the limit of cylinder size. Using high speed and high mean effective pressures, cooling the valves becomes a grave problem, and cooling the pistons is also a thing to be considered. To keep down valve temperatures more than two per cylinder can be used, even more than four if necessary, but the piston ultimately limits cylinder bore. Just at present the idea seems most prevalent that 5 in. is about the extreme limit,



The Curtiss twelve, which has been developed direct and not from automobile experience. Peculiarities are the valve layout and the bolted-on exhaust ports with their air-cooling fins. The method for supporting the crankcase in the plane is also unusual



and that the cry for more power will be met by more cylinders, perhaps 18 or 24, all on the same crankshaft, perhaps by using more than one engine for a plane.

At the one-day meeting of the S. A. E., which will be held Friday, Feb. 9, in the Engineering Societies Building, many problems such as those briefly outlined will be discussed, and the subject of engine construction will be introduced by Leigh M. Griffith in his paper on "High Pressure Aviation Engines." Griffith, who has had much invaluable experience in developing the Martin aviation motor, discusses the subject analytically, pointing out the fundamental differences between the old style of large, low pressure engines, and the modern type, and he shows very clearly how the high pressure design is able to be built lighter for its power. On the question of what is high pressure, Griffith puts the dividing line at 100 lb. brake mean effective pressure, classing all engines developing more than this as high pressure, but he hints that this figure may soon be exceeded. The limiting factors now, according to his paper, are valves and spark plugs, particularly the latter, which still give frequent trouble.

A very important point, he says, is the form of construction adopted for the cylinders, as they compose a large part of the weight of the engine, have a considerable stress to bear, and the valve and spark plug troubles are greatly aggravated by too great a thickness of cylinder metal in their vicinity. He reviews the different types of cylinder as follows:

"The best method is to diminish the thickness, or rather the thermal resistance, of the walls somewhat in inverse proportion to the increase of unit heat-conduction capacity required. Such a method, however, involves the use of a higher grade of material for the cylinder walls and demands a greater attention to the problem of allowing the cylinder walls the greatest amount of freedom to expand in all directions under the influence of heat so that the minimum restraint is offered to such movement. It is this restraint that distorts the walls from their original form. It is also necessary to insure a more uniform cooling action of the circulating water.

#### Steel Cylinders

"The use of automobile-type cast-iron cylinders for aviation engines, with either integral or applied jackets, is gradually but surely disappearing, for reasons that are well understood. Just now, the popular tendency is to use some form of cast aluminum-alloy cylinder with either a steel or cast-iron liner. This general type of construction is appearing in the individual as well as the block-cylinder form, but it seems to the author to be poorly adapted to the requirements of the really high pressure engine because of the unavoidable fact that the total resistance to the conduction of heat through the walls is greatly increased by the lack of continuity of metal at the joint between the liner and aluminum wall, and also by the considerably increased total thickness of metal. It certainly appears that lubrication is rendered more

### PROGRAM

#### First Aeronautic Session

Society of Automotive Engineers

Engineering Societies Building  
29 West 39th Street

NEW YORK, Feb. 9, 1917.

#### AFTERNOON STANDARDIZATION SESSION 3 p. m.

Henry Souther, Chairman aeronautic engine division, standards committee, presiding.

Necessity of Standardization of Small Metal Parts for Aeronautic Use—  
F. G. Diffin.

Suggestions for Standard Tests of Aeroplanes—J. J. Rooney

#### EVENING PROFESSIONAL SESSION 7.30 p. m.

Vice-president Charles M. Manly, presiding

7.30 to 8.15—Motion pictures of aircraft in flight

8.15—Aerial Navigation Over Water—  
Elmer A. Sperry

9.15—The Evolution of Aeroplane Wing Trussing—Professor F. W. Pawlowski of the University of Michigan.

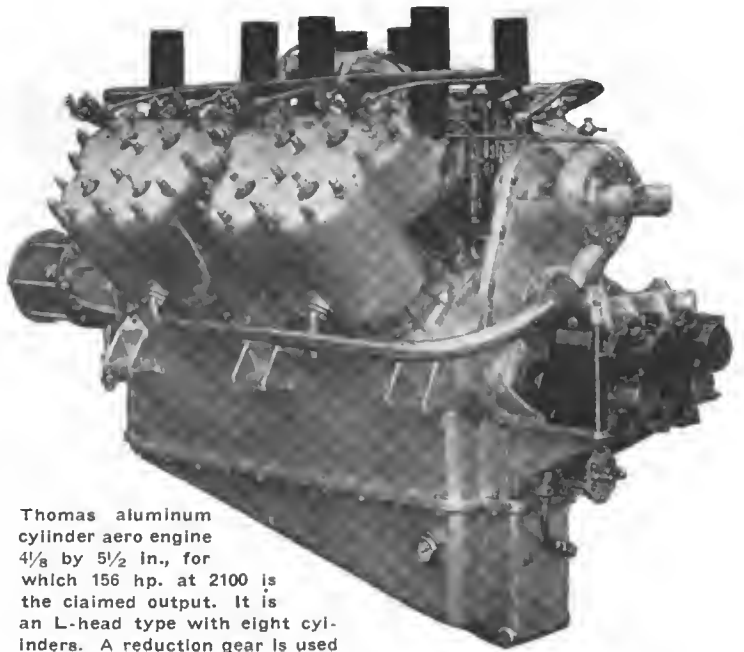
10—Notes on High Pressure Aviation Engines—Leigh M. Griffith.

difficult by this construction and the risk of pre-ignition increased from the same cause.

"A better arrangement, from the heat-disposal and weight standpoints at least, is that wherein the jacket water comes in direct contact with the steel liner. In the latter case, the liner can be screwed into the combustion chamber at its upper end so that the combustion chamber is a part of the aluminum block casting, or the liner can have a closed head-end forming the combustion chamber and with the valves seating directly on the liner material.

"The ideal cylinder has the thinnest possible wall consistent with the maintenance of a satisfactory degree of rigidity; is so designed as to permit the greatest freedom of expansion and contraction under the influence of temperature changes; has uniform wall thickness throughout; and is provided with a water jacket of such design as to give a uniform cooling action over all parts of the cylinder wall. The basic idea is to make sure that each unit of area of heated surface of the combustion chamber and cylinder wall is separated from a like unit of area of uniformly cooled surface by a wall of minimum uniform thermal resistance. Of course, in the case of the piston and valve heads this cannot be done, since these members have to conduct the heat received largely to their surfaces of contact with the cylinder metal, in order to transfer it to the cooling water. In the piston, this is best accomplished by using a metal of high conductivity and a design that provides ample sectional area to conduct properly the heat from the head to the skirt, from which it passes through the oil film to the cylinder wall.

"It seems to the author that there can be but little question as to the one best cylinder construction for the aeronautic engine working under the highest brake mean effective pressure. It is that in which the cylinder units are built up in pairs or blocks from alloy steel parts flame-welded together into one integral whole. A number of advantages are inherent to this form of construction, such as the following: The absolute minimum thickness of metal is required to resist the stresses due to the pressure and thermal effects, which makes for light weight; the minimum thickness of metal wall interposed between the hot gases and the jacket water and the absence of masses of metal tending to accumulate heat make for uniform and effective cooling of all



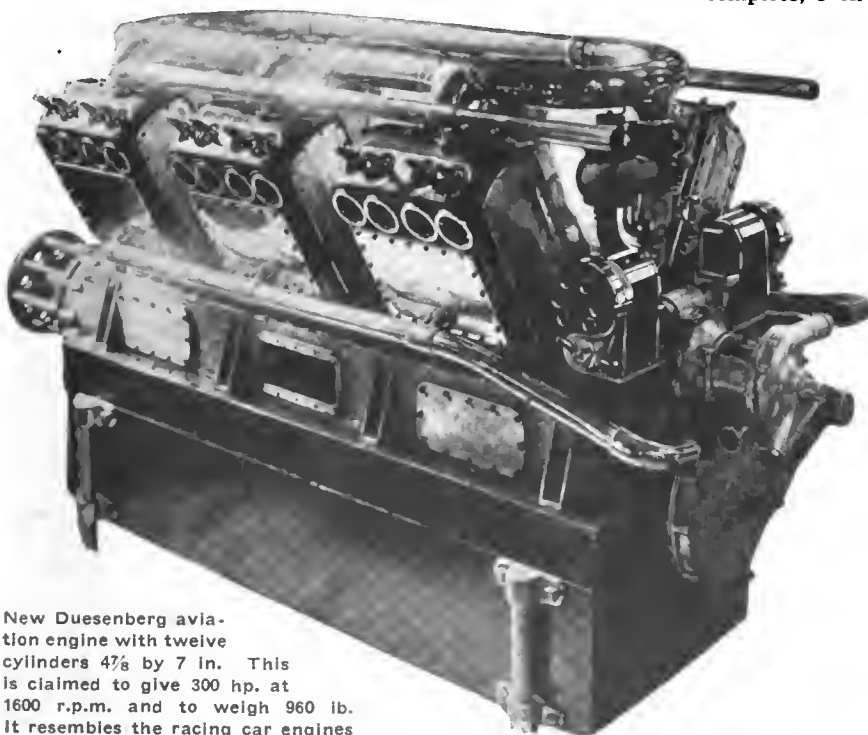
Thomas aluminum cylinder aero engine  $4\frac{1}{8}$  by  $5\frac{1}{2}$  in., for which 156 hp. at 2100 is the claimed output. It is an L-head type with eight cylinders. A reduction gear is used

interior surfaces by water of fairly high temperature; assurance of the homogeneity and character of the material composing the cylinder elements; a definite knowledge of the form and thickness of all walls; the greatest facility of inspection and testing of all joints during the assembling operations—all of these make unnecessary any arbitrary addition of metal in the endeavor to allow for possible unknown weaknesses.

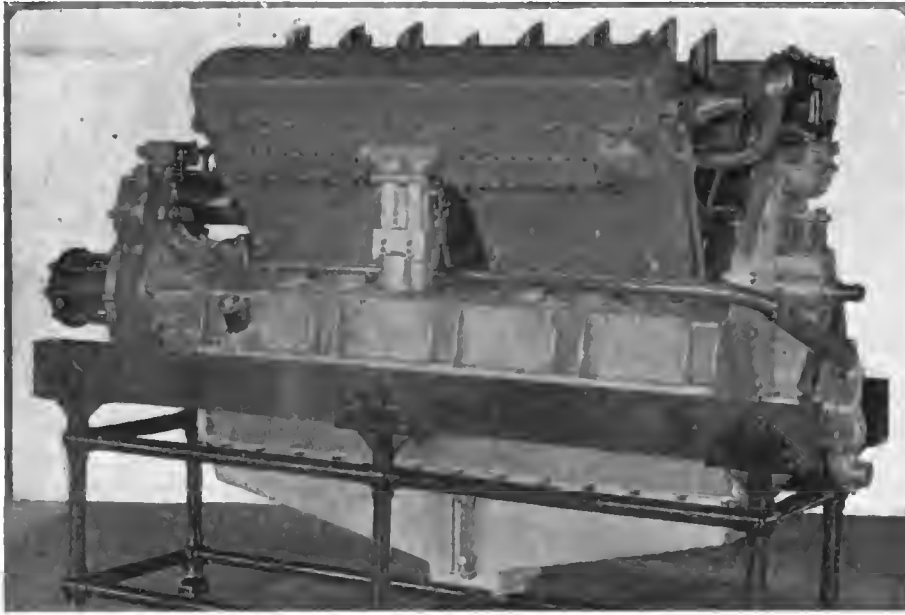
"The author has built  $4\frac{3}{8}$  by 7-in. cylinders by this method, of nickel and carbon steels, in pairs, that weighed only 24 lb. per pair, or 9.8 cu. in. displacement per pound of weight. These cylinders are on an engine that on official test showed a brake mean effective pressure of over 116 lb. per square inch, which is believed to constitute a record for aeronautic engines. The hydrostatic test-pressure for inspection was 1000 lb. per square inch. The cylinders were provided with four valves and two spark-plugs each. The jacketing was complete, even extending to the inlet and exhaust flanges as well as completely around the valve-seats and plug bosses. The fact that these light cylinders stood the high temperature and pressure without distress or heating troubles certainly proves that it is absolutely unnecessary to adopt a heavy construction for these conditions.

"In comparison, it may be stated that the  $4\frac{3}{8}$  by 7-in. cast semi-steel cylinders of a recently announced aeronautic engine weigh 51 lb. per pair, or 5.1 cu. in. displacement per pound, without the cast aluminum covers that close the jacket spaces; and this is only a two-valve engine. Another airplane engine, also recently announced, has built-up steel cylinders with cast aluminum jacket covers; the 4 by 6-in. cylinders weigh 40 lb. per block of three, or 5.65 cu. in. displacement per pound. This is also a two-valve design, and both descriptions have recently appeared in the technical magazines."

Although preferring the steel cylinder, Griffith believes aluminum to be the best piston material both on account of its light weight and of its better heat conducting properties, but particularly on account of



New Duesenberg aviation engine with twelve cylinders  $4\frac{3}{8}$  by 7 in. This is claimed to give 300 hp. at 1600 r.p.m. and to weigh 960 lb. It resembles the racing car engines



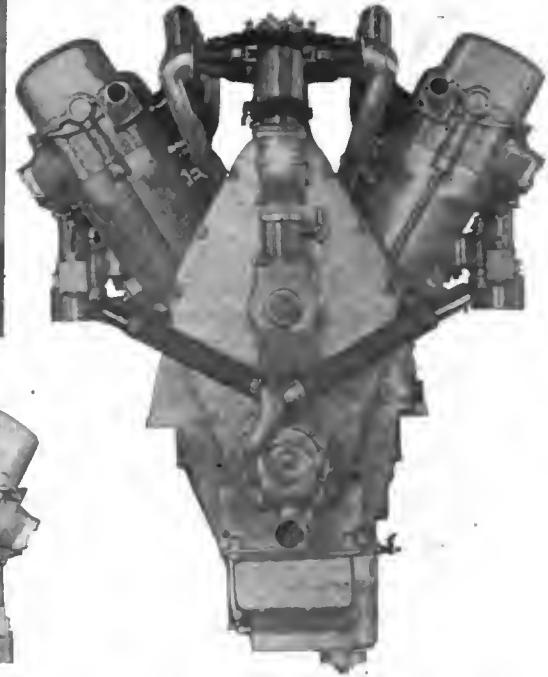
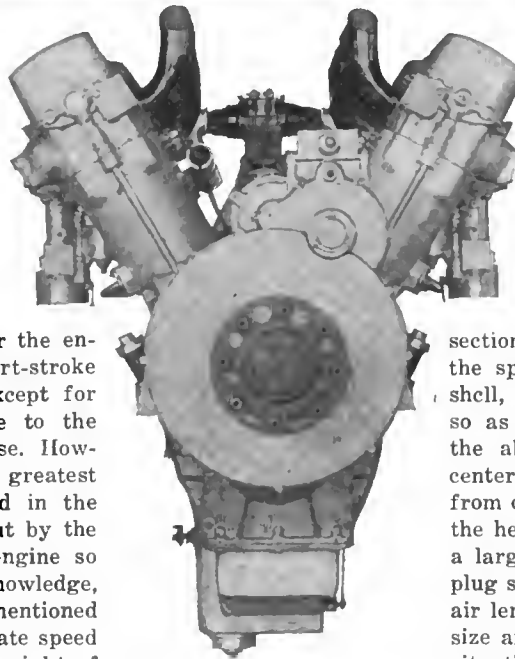
Knox aviation engine,  $4\frac{1}{2}$  by 7 in., twelve cylinders. This has aluminum cylinders with cast iron liners and the camshafts are arranged overhead, operating the valves through rockers. Very high pressure oil is used, running up to 70 lb. per square inch, and the camshafts are pressure lubricated as well as the crankshaft bearings

the latter. In regard to this the paper states:

"Attention has been previously called to the increased intensity of heat absorption in the case of the high pressure unit, but this is almost offset in the case of the piston by the reduced diameter and consequently reduced distance for the heat to travel."

Insofar as its effect on the type of cylinder construction employed is concerned, it matters little whether the engine is laid out as a geared-down short-stroke job or a direct-drive long-stroke, except for the comparatively slight saving due to the shortened barrel length in the first case. However, the author is convinced that the greatest power-weight ration can be obtained in the direct-driven engine; this is borne out by the fact that the lightest water-cooled engine so far officially tested, to the author's knowledge, is the one incorporating the above-mentioned light weight cylinders. At the moderate speed of 1325 r.p.m. this engine showed a weight of only 2.65 lb. per brake horsepower; this weight included the two magnetos complete with all wiring and plugs, the two carbureters and manifolds, all water headers and a particularly powerful pump. However, it did not include the weight of the propeller-hub, starting-crank, exhaust headers, or the contained water and oil. It would seem as if the most simple and direct method to obtain a sufficiently high piston speed in combination with a propeller speed that will come within the zone of high propeller efficiency is to adhere to the long-stroke direct-driven design in which the propeller is carried on an extension of the crankshaft. Certain it is that the total inertia forces of the reciprocating parts for this method are less by a considerable amount than those in the shorter-stroke geared-down engine.

Spark plugs are perhaps the greatest source of trouble in the high pressure engine. If the threaded portion of the shell makes good contact with a well-cooled surface, no trouble is to be expected from the shell itself over-heating. However, the grounded electrode must be of sufficiently high heat conductivity and must have a sufficiently good thermal contact with the shell to insure that the heat received will be carried to the shell and then to the jacket water. The



section of these electrodes should increase from the sparking point to their anchorage in the shell, and should not be flattened or deformed so as to offer a relatively large surface for the absorption of heat from the gas. The center electrode usually gives the most trouble from overheating. This is to be expected since the heat received by it has to be conducted in a large measure through the insulator to the plug shell. Very little heat is conducted to the air lengthwise of the stem, owing to the small size and length of this member. Perhaps this situation can be helped by the development of an insulating material having a higher heat conductivity in proportion to its electrical conductivity than the materials now in use. The greatest improvement is to be looked for along the lines of electrodes with higher heat conductivity, greater sectional area, and perhaps thinner insulators having more intimate contact with both the electrode and shell. The recent idea of introducing a small amount of air or mixture direct to the plug cavity, in such a manner that it washes both the center electrode and insulator, may prove to be a considerable aid.

In an engine developing a high mean effective pressure, necessarily a high volumetric efficiency and a high compression pressure are required; these in turn demand efficient cooling, scavenging, charging and ignition. The cooling requirements have been mentioned and consist fundamentally of the uniformly energetic circulation of the cooling water over a cylinder wall of the highest possible uniform thermal conductivity.

Of the other papers to be presented, in accordance with the program on page 326, Sperry's on aerial navigation over water is devoted largely to a description of his automatic controls for aeroplanes, and the gyro compass.

# Modernized Marine Engines

Automobile Type of Design Gains—Eight Cylinders in Line Favored for Large Units—Large Aluminum Pistons

**N**EVER has there been a motor boat show containing so many engines of the automobile type, or so interesting a collection of engines as were seen at the exhibition in the Grand Central Palace that has just closed. Foremost among the names familiar to the automobile engineer, Wisconsin and Duesenberg had large exhibits, the latter showing the aviation twelve, which is the latest product. Curtiss had a couple of aviation engines, a small eight and a large twelve, there was a new boat engine, the Lacy, which is a large edition of the motor fitted to the Cunningham car, and the older boat engine builders, such as the Sterling Engine Co. and others, had engines more than ever like the modern automobile motor.

## Big Change in Year

Quite a big change is to be noted since the show of a year ago, as the new engines for 1917 are more compact and apparently smaller for their power. Not only is this so of the big power plants, but the smaller boats evidence a tendency to be fitted with regular four cylinder automobile engines rather than with two-stroke types or the three-cylinder gas engine style that has been very popular. At the other end of the scale the heavy oil engine for commercial craft of the hot bulb or so-called semi-Diesel type is getting neater, though its slow combustion precludes the use of high speed.

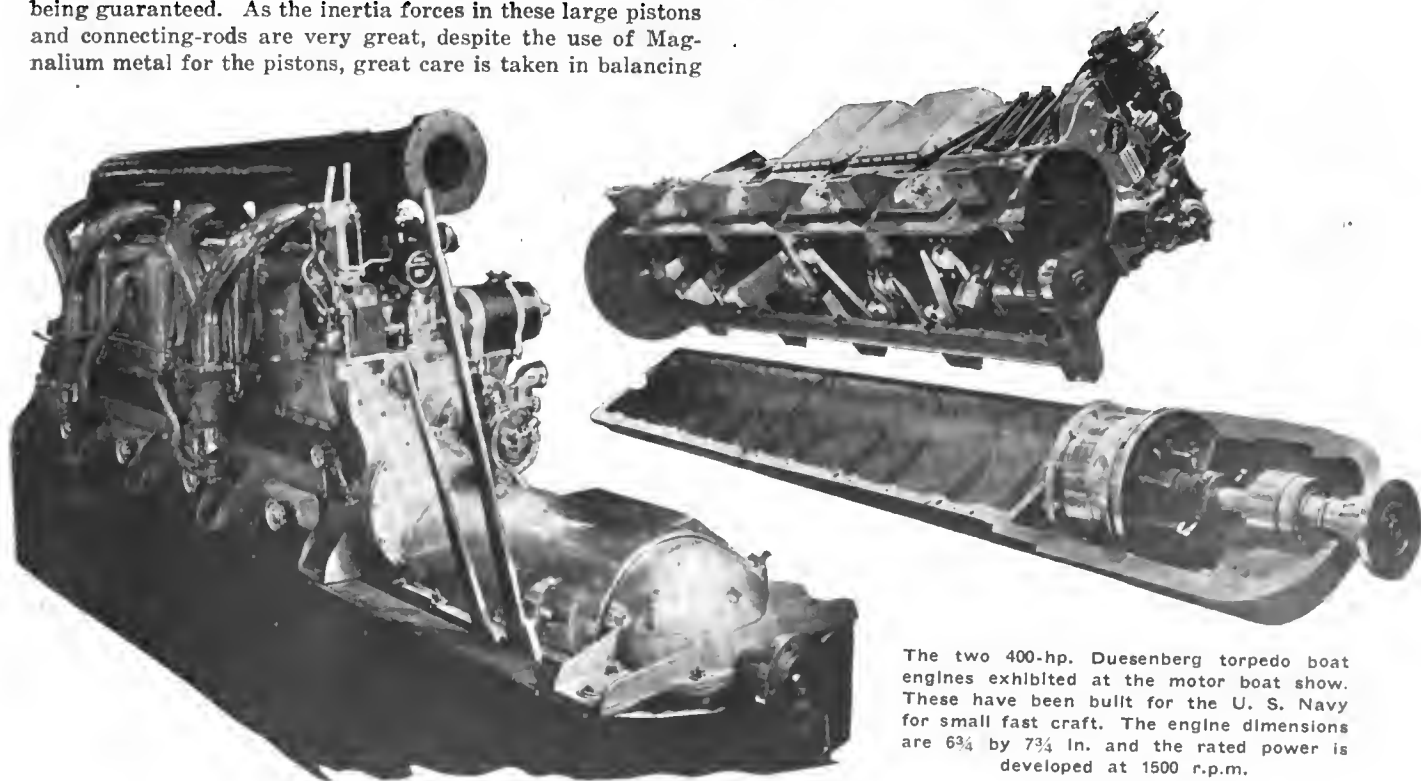
Of all the engines on the floor there was none more interesting than the big Duesenberg built for a U. S. small torpedo boat. This, as the illustrations show, is similar in principle to the Duesenberg racing car engine, having the same valve layout and the same rocker operation. The cylinder dimensions are 6¾ by 7¾ in. and the rated power is 275 at 1000 r.p.m. and 400 at 1500 r.p.m. the delivery of this rated output being guaranteed. As the inertia forces in these large pistons and connecting-rods are very great, despite the use of Magnalium metal for the pistons, great care is taken in balancing

by keeping the reciprocating weights for each cylinder close to a fixed amount and allowing very little tolerance. There is a very elaborate pressure lubricating system, feeding every part, even to the rocker arms, and splash can be used in addition if desired. There are two oil pumps, one feeding the pressure lines and the other for the purpose of exhausting the crankcase to a level that can be controlled at will. Oil taken from the engine is pumped to a main supply tank in the engine room, whence the pressure pump obtains its supply, the idea being that the body of oil required to insure a sufficient supply of cool lubricant is too great to be carried in the crankcase.

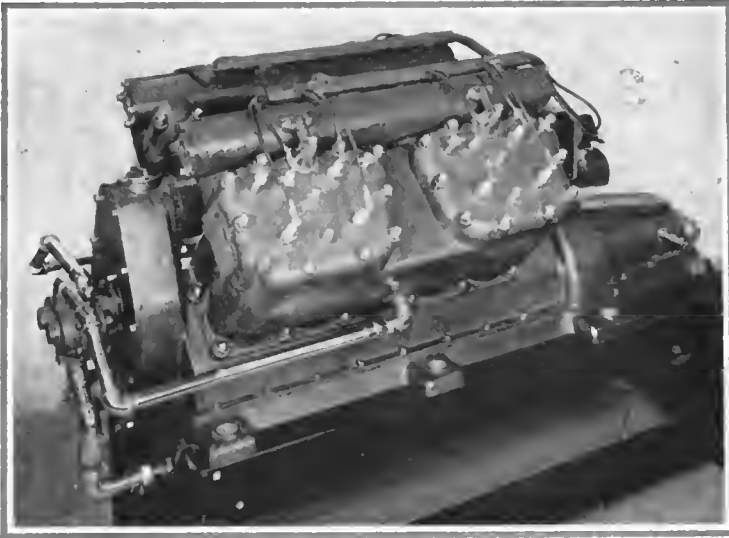
For the crankshaft a hammer forging is used of alloy steel and the camshaft is a drop forging with integral cams. Semi-steel castings are used for the crankcase, and these are heavily ribbed to give the requisite rigidity.

For ignition there are two systems, magneto and battery, and a starting and lighting outfit of regular automobile type is provided. The engine has a Bendix engagement and appears wonderfully small for the job of cranking such an immense engine. It is interesting to note that the price of the complete plant is \$5,500.

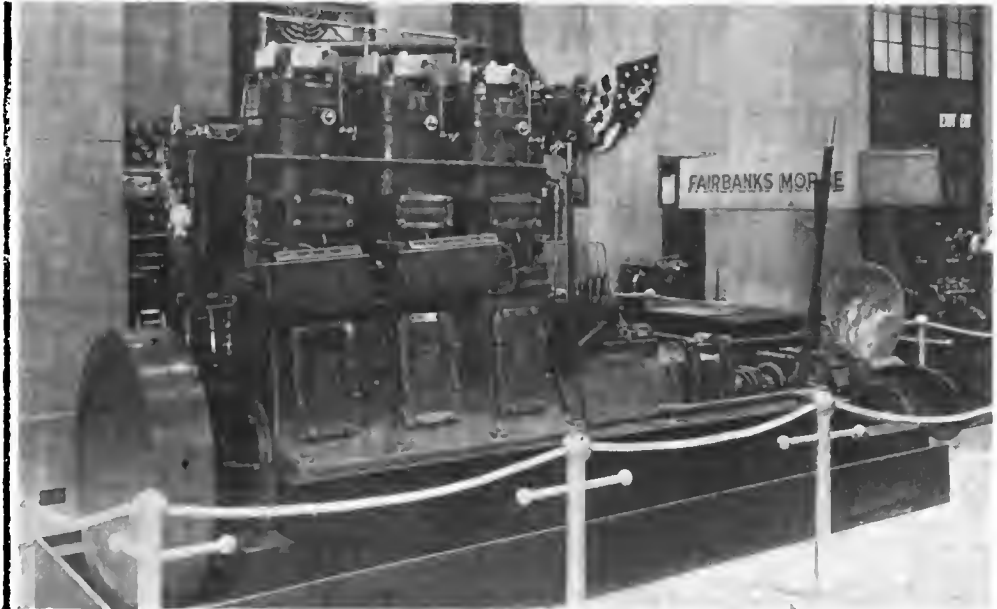
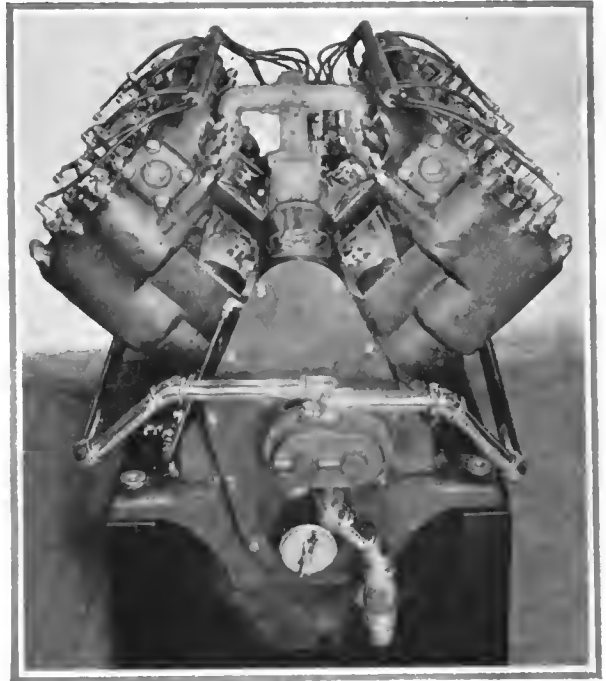
It is noticeable that the boat engine is often built as a V motor, probably because narrowness is a quality in high-speed boats, especially where two engines are used. For one engine, however, the V type has advantages and the latest addition to the ranks of boat motors is the Lacy shown opposite, it being designed by the originator of the Cunningham car eight-cylinder engine, new a year ago. This is being made in two sizes, both with eight cylinders; the smaller is 4¾ by 6 in. and the larger 5¾ by 6½ in. The two engines are rated at 100 and 200 hp., respectively.



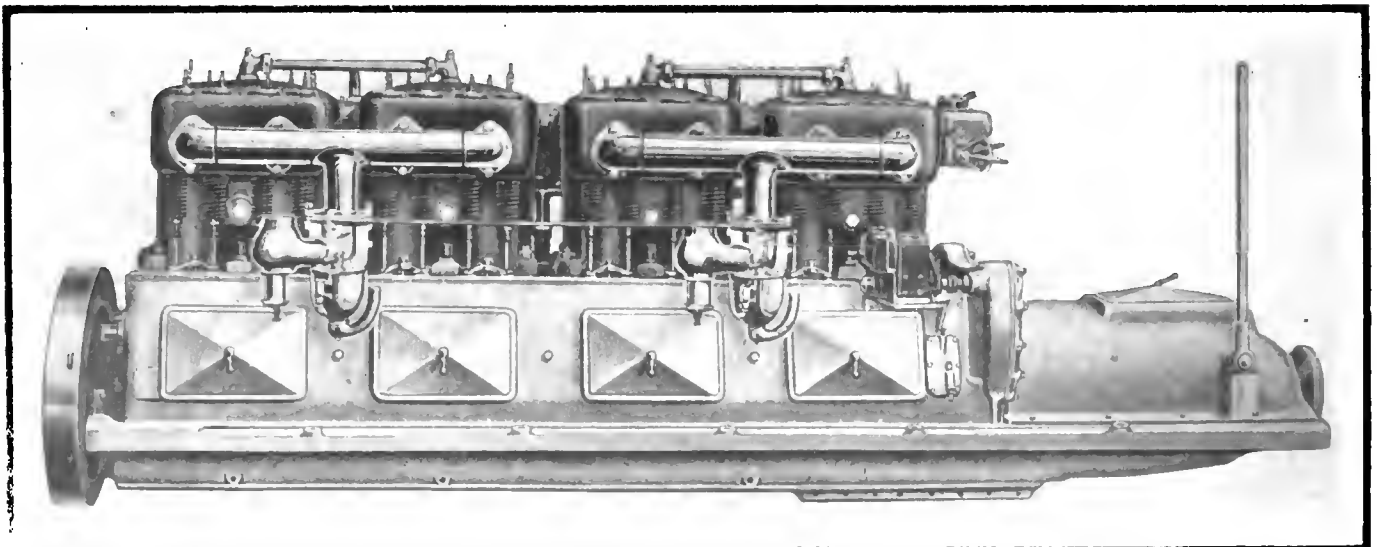
The two 400-hp. Duesenberg torpedo boat engines exhibited at the motor boat show. These have been built for the U. S. Navy for small fast craft. The engine dimensions are 6¾ by 7¾ in. and the rated power is developed at 1500 r.p.m.



The Lacy eights for marine work are closely similar to the engine of the Cunningham car. Two sizes are being made,  $4\frac{1}{4}$  by 6 in. and  $5\frac{3}{4}$  by  $6\frac{1}{2}$  in. Cold water is drawn through the crankcase on its way to the pump before going to the cylinders, this being for the purpose of cooling the oil.



The Fairbanks-Morse engine on the left is a hot bulb or semi-Diesel type operating on heavy fuel. Below is the newest Sterling engine intended for fast cruising boats. This has cylinders  $6\frac{3}{4}$  by 9 in. and gives 300 hp. at 1000 r.p.m. It is a heavily built engine weighing over 5000 lb. and is frequently used in sets of two or three for twin and triple screw applications. The engine has an electric starter and the fuel used is gasoline.



# MANUFACTURERS' Manufacturer to Distributor Dealer, Buyer

# MERCHANDISING

*First Article of a New Series to Appear Weekly*

## How Saxon, Paige and Mitchell Grasped Business Opportunities of Show Week Dealer-Dinners at Chicago

**T**AKING advantage of the Chicago automobile show has yet to be learned by several automobile makers. True, they show their cars and meet a lot of dealers, but do not put over the selling arguments and business talks with their dealers that they have good opportunity to do. Several makers give a so-called dealers' dinner at noon or at night. Some have several hundred present, and after the dinner there is a movie reel, a few songs, a few stories and then adjournment.

They are not all like this. A few at least have got a gage on Chicago show value and away last fall set out to cash in on it as well as on the New York show. Compared with a year ago, last week at the show gave evidence of big improvement. There were two or three dinners for dealers on a higher plane than any previous ones. Several other makers showed creditable improvement over their efforts last year, but opportunity remains for much yet to be done.

Three of the best dealers' dinners given last week were Saxon, Mitchell and Paige. Each filled a peculiar field. Mitchell had a salesman talk with a movie reel or two assisting the lecturer, and Saxon had not a selling talk, but a better business talk with movie and still pictures to help it out. Each was specially good in its field. Each impressed all dealers assembled that the factory meant business and that there was business, and business only, back of the factory selling method of Mitchell, and that business permeated every phase of the Saxon organization.

### *Saxon Dealers Learn Factory Problems*

The Saxon talk by President Harry Ford was the best one of the kind during show week. It was a business talk he had been preparing for weeks. The pictures were well selected and the talk delved into a dozen factory problems.

No. 1—Mr. Ford told dealers what it cost his factory because of poor business methods of some dealers. One Saxon dealer could not be made to answer letters. The company wrote him for 30 months with no results, and finally Mr. Ford sent him a personal telegram which brought a reply. The bad business of this dealer cost the Saxon factory \$8.

No. 2—Mr. Ford explained that the labor turnover in the Detroit automobile factories is 1100 per cent per year. That is, to keep a force of 100 men for a year requires hiring 1100 men, which is a terrific expense to any factory. He then told how the Saxon labor turnover is only 207 per cent; in other words,

for every 100 men the Saxon company keeps from year to year it requires hiring 207 men. This is a very favorable showing compared with the Detroit factory average. You have not to go around the corner and ask the man you want to explain how such an example hit the Saxon dealers. Their applause showed they caught the idea and read into the talk the fact that it costs Saxon less to maintain its factory force than it does certain other Detroit factories, that because of this the car can be made better at a lower cost, and that they as dealers are getting more for their money than if the labor turnover percentage were 1000 per cent or higher.

### *Dealers Must Improve Letters*

No. 3—Dealers were reprimanded for poor letter writing, and incidentally told indirectly that when they cannot write a plain understandable business letter it is more than certain that they cannot handle a business much better. A letter of complaint from one dealer, which was shown on the screen, showed that the dealer dictated a three-quarter page letter and yet failed to state a single trouble he had. He apparently forgot that in the effort of dictating the letter. Mr. Ford told the dealers how to write complaint letters: First to state specifically the real trouble, second to state if the trouble happened during shipment, and third to state if the trouble had apparently happened before the car left the factory. From this date forward the several hundred Saxon dealers at the dinner will send in proper complaint letters.

No. 4—Such a meeting afforded an excellent opportunity to tell dealers about the good qualities of the car. To do this several inspection reports were thrown on the screen. One showed the chemical report of steel analysis; another showed the physical test of certain parts; others were inspection reports covering accuracy of manufacture; and finally, to clinch the argument, the speaker told of the mass of parts rejected and then had projected on the screen pictures showing stacks of rejected parts, including nearly everything in the car. From several tables came the remark, "I never thought they were so careful." The argument struck home. It made them all better Saxon dealers.

### *How to Write Complaints*

No. 5—One letter on the screen told of a complaint about shipping only two Saxons in each railroad car,

whereas the factory had agreed with the dealer in question to ship three. As a result of shipping only two in each railroad car it was costing the dealer over \$8 per car more than formerly. The dealer had been told of the reason, but the lesson was driven home to all at the dinner when two diagrams of railroad cars were thrown side by side on the screen. One showed how it was utterly impossible to put three Saxons in each freight car, and the answer was that they had to take whatever freight cars they could get and the ones they were getting were several feet shorter than the regular ones. It did not call for a long argument to tell the dealers that it was better business for them to get two cars on time, if at a little higher cost, than not to get any. The argument was a bull's-eye.

#### *Realizing Sales Opportunities*

No. 6—Two stormy-day pictures thrown on the screen drove home a good selling argument with every dealer. One picture showed a salesman looking out of the salesroom window at the driving snowstorm. The dealer was thinking to himself, "No use of stirring out, nobody wants to buy a car to-day, I might as well go home." The next picture was the complement of the salesman. It showed a business man just up from the breakfast table on the same stormy day. He was looking out of the window at the blinding snowstorm and was contemplating: "I certainly wish I had taken that salesman's advice and bought that sedan car 6 weeks ago. He told me how fine it would be on such mornings as this. To-day it will certainly be unpleasant waiting on the corner for the street car and then getting into an ill-smelling car filled to the doors." No further comment was necessary. It was a home-run sermon on stormy-day salesmanship.

#### *Must Read Circular Letters*

No. 7—Red blood was even put into the circular-letter argument. This is how President Ford put it: "You dealers must read circular letters. These letters make it possible for us to give greater value for less money in every Saxon car. If we sent you all individual letters we would have to employ many more stenographers. Years ago the business man wrote individual letters, wrote them in long hand. To-day with special automatic typewriters or by duplicating machines thousands of circular letters are sent out in a few hours. They are amazingly cheaper. The dealer must receive a circular letter from his factory in the spirit of factory co-operation and good business economy. We sent you a circular letter telling about increases in demurrage rates. That letter was just as carefully written, a little more so, than if we had dictated an individual one to each of our hundreds of dealers." The argument went home.

No. 8—All factory heads were introduced by having the pictures shown on the screen, followed by another screen giving a brief typewritten outline of where each had worked and the experience he had. These little biographies got under the skin of the dealer. They told how one department head had for 5 years been assistant department head in one of Detroit's largest factories and previous to that had been with a large railroad or engineering house. These biographies were three-base hits. All around were heard

remarks: "He's a good man," "Where did they get so many men with such good experience," etc. Here, without the speaker uttering a single word, all of the dealers present were being convinced of what real brains there are in the Saxon factory.

#### *Five Essentials for Saxon Dealers*

No. 9 and Last—One screen told of the five essentials that the Saxon factory expected in every dealer. They are:

- a—A good store.
- b—A good service station.
- c—Persistent local advertising.
- d—Good salesmanship.
- e—Good co-operation in every detail of the work.

Each of these was amplified and good arguments handed from a maker to a dealer.

President Ford introduced something good when he adopted the plan of projecting on the screen short paragraphs instead of telling the dealers the same thoughts. By putting them on the screen it made every dealer read every word. Generally they got more out of the paragraphs than if they had just listened to them. There was much novelty in the scheme. The novelty attracted the dealers, but the plan went still further and drove the argument home much better than if all the words had been spoken.

#### *Mitchell Merchandising Methods*

George Hipple, merchandising expert of the Mitchell company, gave one of the best car selling talks heard for some time at a dealers' noon-day dinner. He synchronized everything he said with a series of movie reels. The movie showed Hipple selling a car to a customer in a salesroom. In making the sale he showed him every detail of the car and as the movie showed Hipple pointing to the handle at the end of the windshield or any other part, Hipple in person was talking the very argument to the audience of several hundred dealers. He went through about fifty or sixty car-selling arguments in this way.

For example: He told of the cantilever rear springs and then got into the car to show the spring action, and before doing so located the buyer so that he could see every movement of the spring, which, by the way, was admirably brought out on the screen.

Further: Hipple went through the car from A to Z in this thorough way, and his selling arguments were so well worded and so brief and to the point that from start to finish he did not hesitate, did not misuse a word and did not repeat or wander from the point. The whole conversation was an example par excellence to all dealers on knowing their selling arguments backward.

#### *Emphasizes Thorough Selling Policy*

It could not but impress every dealer with the thoroughness of the Mitchell selling policy. It took time and money to get up such a reel and every dealer went away conscious of the fact that Mitchell was expecting him to be a better salesman in 1917 than he had been in 1916. He went away feeling that he must brush up his selling arguments, and that if he does not make good this year he will stand a good chance of losing the agency before 1918. The talk from start to finish showed that the Mitchell company

means business in selling cars. It showed that the Mitchell company expects its dealers to sell cars on a business basis.

You were particularly convinced of the fact that Mitchell dealers left that luncheon with a much higher estimate of the Mitchell company than that with which they arrived. They could not do otherwise. That is one proof of a successful dinner, and Mitchell's was a genuine success.

#### *Paige Has Real Business Talk*

Paige has improved its dealers' talk wonderfully over a year ago. Last season the talk had many good features, particularly the movie of the factory assembly system. But then the talk was a little below par and this year it is just as much above par. This year's talk makes no mention of competitors, but gets down to the business of selling Paige cars, telling how it can be done. The talk carries all through it the sentiment of better dealers. Dealers must handle their business on a better basis. There must be better bookkeeping systems, a better understanding of overhead costs, better understanding of what it really costs to sell a car, and a better knowledge of the scientific principles of salesmanship.

These are days when automobile makers must look more and more to their dealers. These are days when

the business factory is getting better dealers and dropping its weaker ones. There is not a factory that can afford to let the Chicago, New York, Minneapolis, Kansas City, Boston and a few other shows pass without carrying to their dealers the message of higher business standards.

Better merchandising is the work of many factories. The work of a factory does not end with the production of the car and the signing of the dealers' contract. It goes further. The dealer is the come-between, the connecting link between maker and buyer. The dealer should breathe the policy of the factory. If he does not then the spirit of the factory never reaches the buyer.

#### *Must Look to Dealers*

This is why some cars are strong in certain cities and deplorably weak in others. You know a car that is strong in Minneapolis and hopelessly weak in Kansas City. The reason rests with the dealer. One dealer has the spirit of the factory. The other has not. If you are weak in Denver lay the fault at your door and not at the dealer's. It may be the dealer has never got warmed up with the factory principles, the factory arguments, the factory methods. It is up to you to get them into his head. Do so by these show dinners.

## New Oakes Plant Improves Shipping Facilities

**B**BETTER shipping facilities characterize the new plant of the Oakes Co., Indianapolis. The factory has its own belt line switch connecting with twenty-one railroads. It is within two blocks of a freight station and is located on the main line of the New York Central.

The Beartone fan-horn, the combination license bracket, crank support, car lock for Fords and Kranklock are made in buildings which are constructed entirely of reinforced concrete. The factories are thoroughly modern in every way with large windows and improved machinery for every operation.

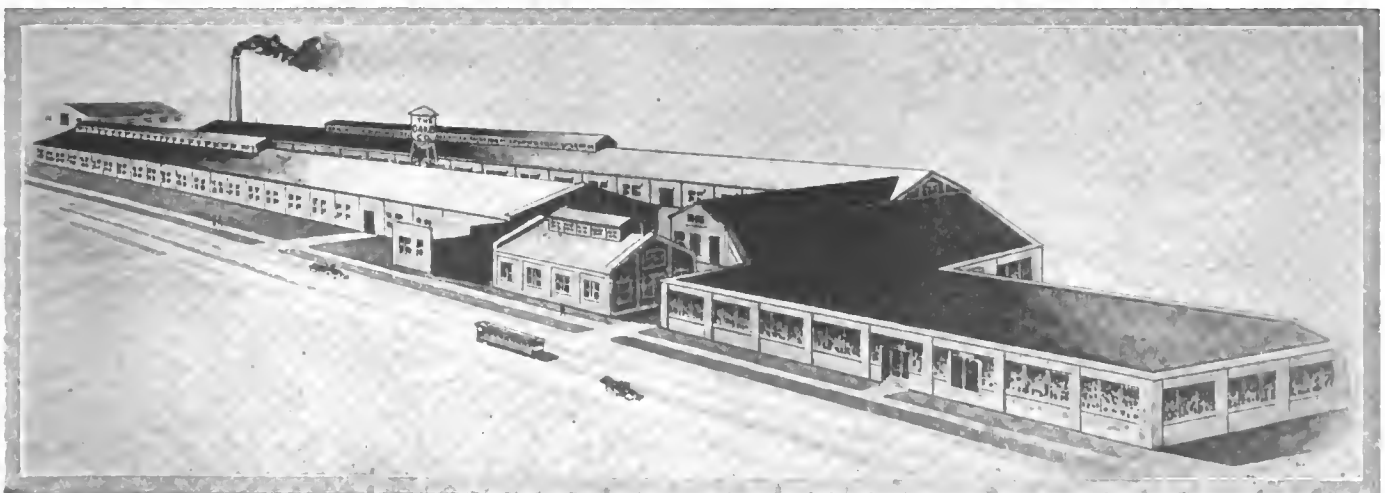
In the front of the longest of the new buildings are the general offices. New quarters are also provided for the testing and engineering departments. Completely equipped locker rooms where the employees may have adequate room for the changing and keeping of clothing are among the many improvements.

In the metal stamping department in which pressed steel of all kinds is manufactured, additional machinery has been placed so that heavier parts may be stamped than has been possible in the past.

This development has not been along the line of intensive improvement alone, but also in actual extent. The factory space has been doubled in size, the older building being renovated to furnish accommodations similar to the newer parts of the plant.

The Oakes factory is following a line which has met the constantly growing approval of manufacturers in the past twenty years, namely that it pays in every way to have the best equipment. Well ventilated factories with large windows and providing every convenience for the worker are not only more comfortable, but also show better profits.

The Oakes Co. now makes radiator cooling fans for 175 makes of cars.

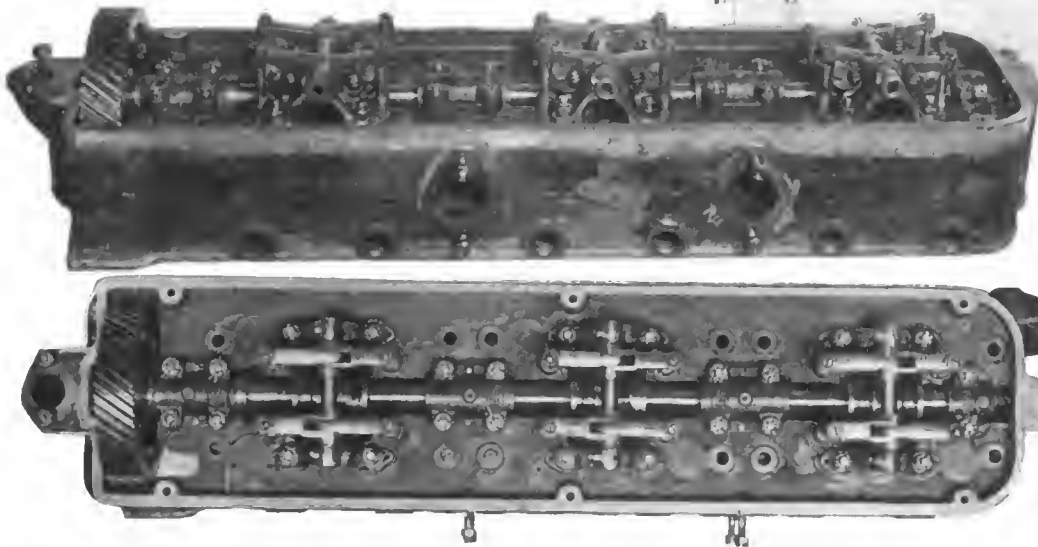
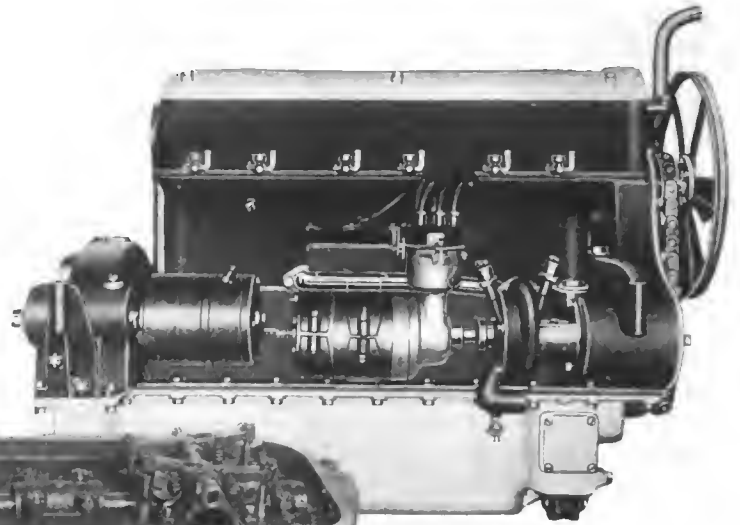


New plant of the Oakes Co., Indianapolis, which has private belt line switch connecting with twenty-one railroads



# No Valve Springs in Amalgamated Light Six

Valves Are Operated Positively  
for Both Opening and Closing  
—Engine is 3¼ by 4½ In.



Amalgamated Light Six 3¼ by 4½ In. with positively - operated valves. The two views of the head show the general layout of the valves and also the trough oiling arrangement employed

**I**T was announced in THE AUTOMOBILE for Jan. 18 that the Amalgamated Machinery Corp., Chicago, a concern created for the manufacture of munitions, would shortly produce a new stock engine. This was announced during the Chicago show and has a special feature in that the valves are operated positively both for opening and closing, there being no valve springs in the ordinary sense.

### Mechanically Closed Valves

The valves are ordinary poppet valves and are set vertically in a detachable cylinder head. They are arranged in two rows, the intakes on one side and the exhausts on the other, and down the center of the head is the camshaft, this lying between the valve stems. Between each pair of cylinders is a short rocker shaft which is placed transversely across the cylinder head, and there are fore and aft rockers to operate the valves. Each rocker is L shaped, one end being attached to the valve and the other carrying a roller, and the roller fits in a groove cut in a block attached to the camshaft. This groove is of such formation that the camshaft turns the roller, and so the rocker is caused to move to and fro in accordance with timing requirements.

It would, of course, not be possible to make this positive action close the valve and hold it closed without having a slightly elastic member secured between the cam

and the valve itself. For this purpose there is a small spring which is said to have a compressibility of about 1/64 in., and in closing the valve the roller pulls the rocker about this amount further after the valve is on its seat. This holds it down firmly, but the amount of movement is so slight that it does not delay the rapidity of opening, and the mechanism ought not to be liable to suffer from fatigue of any kind.

For each pair of inlets and each pair of exhausts only one cam groove is required, the way in which the rockers operate being shown in the photographs. It will be noticed that the camshaft lies in a trough, and this is kept filled with oil so that all the rocker mechanism is continually bathed with lubricant. Oil is supplied from the pump and can overflow, after reaching a certain level, at either end. The front end takes it down to the timing gears and the other returns straight to the sump.

The engine at present being made is a six-cylinder 3¼ by 4½, and uses the somewhat unusual four-bearing construction for the crankshaft, there being two balancing disks attached, as can be seen in one of the photographs. Crankshaft oiling is all under pressure, the shaft being drilled for the supply to the crankpins. For the pistons cast iron is used, and they are only 3¼ in. long, carrying three Wasson rings. The pin is held in the connecting-rod turning in the piston.

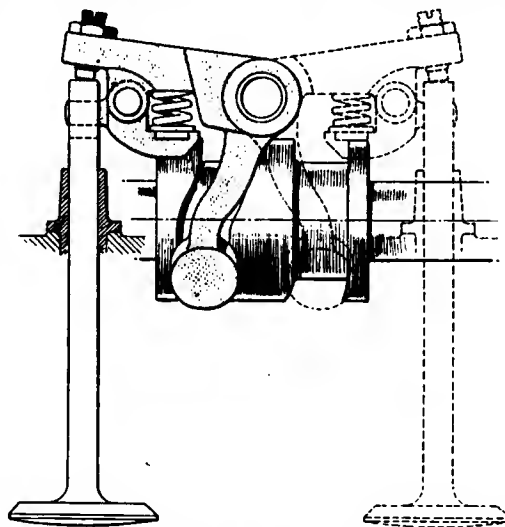
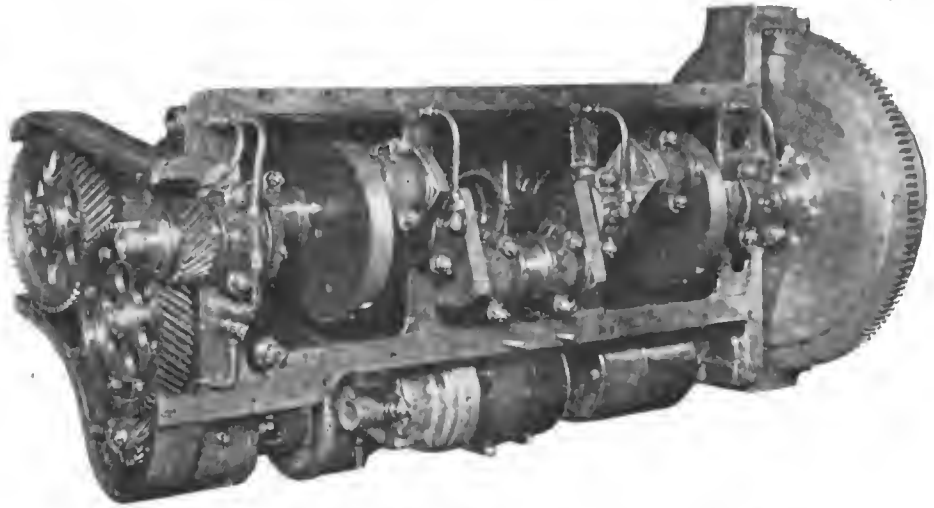


Diagram of Amalgamated valve operation showing the spring and trigger to insure firm seating

It is stated that the engine has been built with performance more in view than price, and that the best grades of materials have therefore been used. The 1½ in. valves are of Rich tungsten steel, connecting-rods are chrome nickel and the crankshaft is of a similar material. It is pointed out that the engine is not abnormally high, as is the case with some overhead valve designs, the actual dimension from center of crankshaft to top of valve cover being 21 in.

In the view taken from beneath it is seen that the layout of the oil piping is rather uncommon, the pressure feeds being taken to the caps of the bearings and the main channel, which is cast in the crankcase, is connected up by short pipes. This assists manufacture by enabling all the oilways to be cleaned out effectively before assembling the engine or during overhauling which is not



The crankshaft of the Amalgamated Six is balanced by two disks

usually possible when all the oil passages are concealed within the aluminum of the crankcase.

## Maxfer Makes New 1-Ton Truck

Worm-Driven Dependable Has Four-Cylinder Engine 3½ by 5—Sells for \$1,195 Equipped

CHICAGO, Feb. 7—A new 1-ton truck, the Dependable, has been brought out by the Maxfer Truck & Tractor Co. of this city. It has complete electrical equipment, worm drive, and a Bailey non-stall differential. The price for the truck including cab, curtains, windshield and standard platform body is \$1,195.

### Two-Unit Type Electric System

The power plant consists of a four-cylinder, four-cycle, water-cooled engine, with 3½-in. bore by 5-in. stroke, and develops full 30 hp. Lubrication is force feed by pump and splash. The starting and lighting system is a two-unit type with all wires carried in a conduit. The front headlights have dimmers and the vehicle is also equipped with an electric tail lamp.

The frame is 4 in. deep, heavily re-inforced by cross members and gusset plates. The springs front and rear are of the half-elliptic, no center bolt type. The rear springs are 3 in. wide and 51 in. long.

The front axle is a drop-forged I-beam with heavy steering knuckles and spindles. The rear axle has a David Brown worm drive with extra heavy axle housing requiring no truss rods.

### Brakes Are Large

The emergency brake is internal operating with a 13½-in. diameter and a 2½-in. face. The external contracting service brake has a 14-in. diameter and a 2½-in. face. Brake equalizers are provided on the rear axle.

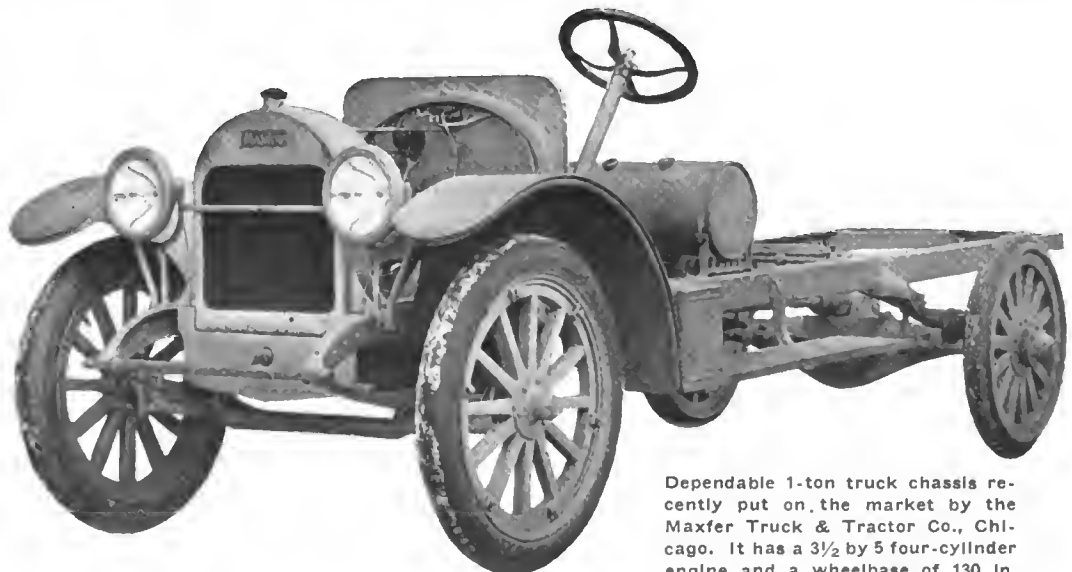
The front wheels are 34 by 4; pneumatics and

solids are carried on the rear of the same size. The chassis has a 130-in. wheelbase with a 56-in. tread. The loading space 6 ft. wide and from 9 to 11 ft. long, according to the body used.

The aim of the engineers was to build a heavy duty 1-ton truck, which will carry light loads at high speed and heavy loads without breaking down. The new truck was exhibited at Chicago in a special showroom directly opposite the Coliseum at 1512 Wabash Avenue. It is planned to turn out 2000 of these vehicles a year. The Maxfer company expects to turn out 28,000 of its truck units annually. One of its largest lines will be the converter for Fords, styled "Whale-for-Work."

### Quadrupling Factory Facilities

To meet this enlarged production plan the Chicago plant is being quadrupled in size, and in addition there is a plant at Martinsburg, Va.



Dependable 1-ton truck chassis recently put on the market by the Maxfer Truck & Tractor Co., Chicago. It has a 3½ by 5 four-cylinder engine and a wheelbase of 130 in.

# Foreign Trade Department

“Foreign Trade, like domestic trade, is essentially an exchange of commodities—If we wish to sell our goods abroad, we must in turn purchase from foreign producers” — Willard Straight.

By David Beecroft

**P**ITTSBURGH, Pa., Feb. 7.—“To-day the American people are for the first time alive to the importance of foreign trade. They realize that foreign trade is essential to the welfare of the country. The tariff, therefore, whatever its local effect may be, is as it affects foreign trade, essentially a national issue.”

In these words, Willard Straight, vice-president of the American International Corp., New York City, an organization formed to promote foreign trade, voiced what he considers the dominant thought in connection with foreign trade, as set forth in his address at the Fourth National Foreign Trade Convention held in this city a week ago. Mr. Straight dwelt especially on the necessity of the United States requiring a bargaining tariff, in order to meet the various tariff divisions that will be made by European countries at the close of the war as well as to meet changes these countries have already made.

## Cannot Meet Europe's Tariffs

At present our tariff is entirely barren of any bargaining feature in that it is not possible to raise import duties but only possible to lower them. To-day European nations are raising their tariffs but our country is powerless to meet these raises except through the slow and ponderous course of Congress. Mr. Straight contends that if the President were given the privilege of raising the tariff on different articles, or giving him the bargaining feature, it would then be possible to meet the different steps taken by Europe and do it quickly. He considers this a prime essential.

Mr. Straight gave some illuminating information with regard to our existing tariff. We quote briefly as follows:

“Under our present tariff 60 per cent of the articles imported into this country are imported free of duty. Ninety-five per cent of the value of imports from South America; with the exception of Cuba the same proportion of imports from Central America and West Indies; 90 per cent of the imports from Africa; 97 per cent of the imports from Oceania; and 70 per cent of the imports from Asia, now enter our ports without payment of duty.”

Besides considering the bargaining tariff the prime essential for export trade Mr. Straight emphasized the fact that, while the United States may be the richest market in the world after the war, our manufacturers must not forget that international trade, like domestic trade, is essentially an exchange of commodities, and that if we wish to sell our merchandise in foreign lands we must in turn purchase from those countries.

We quote Mr. Straight on this subject as follows:

## Export Trade Not One-Sided

“The trend of economic policies in Europe is manifest. The need for maintaining our export trade is obvious. The United States will be the richest market in the world after

the war. The United States will be the most serious competitor which European industry will be obliged to meet in its campaign for recouping the losses of the present struggle. This war has demonstrated the fact which some of us in this country have heretofore been disposed to ignore—that international trade, like domestic trade, is essentially an exchange of commodities. We cannot hope that we shall continue to sell some \$3,000,000,000 more of goods than we buy. Commercial relationships to be permanent must be mutually advantageous. If we wish to sell our goods abroad, we must in turn purchase from foreign producers. Our purchasing power, therefore, is our first line of economic defense. To utilize it as such we must be able intelligently to regulate the importation into this country of goods which other nations desire to sell to us. By so doing, we may demonstrate the advantages which they may gain by purchasing articles which we in turn desire to export.

“We need a bargaining tariff. A bargaining tariff to be effective should be flexible. It should be possible to apply its provisions to meet situations as they arise. Our present tariff laws are inadequate from both points of view. Whatever be the underlying principle of the tariff it should possess adequate resources for the encouragement of our foreign trade and its protection from undue discrimination.

“It is not the purpose of this paper to enter into a general discussion of our tariff problems, to attempt to justify either a protective tariff or a tariff for revenue only. A general revenue bill may be based on one theory or the other. But whatever its underlying principle, a tariff law may be so framed that within certain specified limits fixed by Congress, the Executive may utilize the tariff either to secure concessions for American trade or to prevent discrimination against our products, or our interests in foreign lands.”

## World's Tariffs Undergoing Revision

Mr. Straight contends that the entire tariff system of the world will be revised and is being revised at present. He contends that belligerents will have to increase their tariff duties to pay interest on the increased national debt, and that to obtain the necessary sums to care for these debts by fresh taxation will be to place an undue burden on capital and industry. He contends that fresh wealth must be created by the development of productive power and that such stimulative production must of necessity find an outlet in export trade. He carried this thought further by contending that although we have much of the gold, or a big portion of it, that this does not insure our international position in trade relations. That France and other belligerents will only buy from us as they require and that it will be necessary for us to make heavy purchases from them; in short, international trade in the future will as in the past continue to be an exchange of commodities.

We quote Mr. Straight further on this subject as follows:

"Although Great Britain has not as yet ostensibly departed from her traditional Free Trade policy, duties have been increased, charges have been imposed on articles hitherto admitted free, and the importation of others has been prohibited. *These changes have been made to raise revenue, to curtail luxury and to give additional space on British ships for the transportation of necessities. But there has been a noticeable trend toward the idea of a tariff for protective purposes. It seems possible, therefore, that a tariff or economic partnership between the United Kingdom and the British colonies, and preferential arrangements between the British Empire and the Entente Allies, may be established.* Similar arrangements may be made by the Central Powers.

"The three Scandinavian nations entered into a comprehensive trade agreement in July last. The difficulty of reconciling conflicting interests may make these combinations unworkable in their most extreme form, but the fact that they are contemplated is significant and must not be disregarded. We do not know what will happen, but whatever it is we should be prepared to meet it. *For example, in order to secure the trade of South America, the United Kingdom may be willing to offer South American countries concessions impossible when the United Kingdom was a free market but feasible under a system of reciprocity which a British tariff would permit.* Under possibly broader preferential arrangements between the Entente Allies or the Central Powers, South American countries may be able to obtain from them preferential rates in return for reciprocal advantages. Offers of this sort, coming from either Allied group, would be particularly attractive, because of long established trade relations, especially with England, Germany and Italy, and because of the large investment which these nations, and France, have made in South America.

#### We Must Protect Our Position

"If the European groupings, as a result of the war, are either collectively or individually to utilize bargaining tariffs as they have in the past, under their maximum and minimum, or general and conventional systems, it is essential that the United States should be in a position to protect its trade. The Entente Allies, for example, apparently contemplate post-bellum discrimination against the trade of the Central Powers. It has been stated that every effort would be made to continue close commercial relations with the neutral nations. Will the maintenance of such relations, however, be made contingent upon the willingness of neutrals to discriminate against German trade? The best method of avoiding such a dilemma is to realize that it may arise. If this or other equally difficult situations are possible, should we not now consider measures which will render them improbable?"

Mr. Straight believes that the warp and woof of our export trade is bound up with tariff questions and that it is as much a part of the manufacturers' work in developing foreign trade to consider our tariffs as it is to consider any other phase of increasing foreign trade. A prime consideration in this connection is that European tariff plan incorporating the "most-favored-nation" clause will perhaps be quite revised and that European countries may after the war go on the reciprocal basis, that is, extending to those countries favorable trade relations providing similar trade courtesies are returned. We quote Mr. Straight on this subject:

"Prior to the war, the commercial relations of the great trading nations were, though differing in detail, generally based upon the 'most-favored-nation' principle. The United Kingdom was the great free market.

#### Most-Favored-Nation Rights

"The British interpretation of 'most-favored-nation' treatment, under which a concession granted to one nation was *ipso facto* granted to all having 'most-favored-nation' rights, was generally accepted except by the United States. The American Government has always contended that, despite

'favored-nation' agreements, special reciprocal concessions imposed no obligation to extend their application to nations not granted similar advantages. Despite this conflict of practice, the United States has in effect enjoyed 'most-favored-nation' treatment from other great trading nations. These arrangements will inevitably be affected by the rupture of the inter-European agreements upon which our 'most-favored-nation' treatment was secured. *The present indications are that Europe may abandon its former practice and adopt the American theory of reciprocal concessions. The United States, therefore, will be forced either to enter into preferential or reciprocity arrangements, or to threaten retaliation in case minimum rates are not extended to our products.*

"By virtue of our ante-bellum arrangements, however, our after-the-war problem will not be to secure fresh concessions either from the nations of Europe or from neutral countries. It will be rather as far as possible to assure the reaffirmation of the old relationships with us, under the new systems which European nations may inaugurate among themselves. The American task will be to protect our exports from discrimination under preferential tariffs which may be adopted by the belligerent groups and under reciprocity arrangements which these groups may endeavor to negotiate with neutral nations. Such arrangements may deny to us 'favored-nation' treatment. This we can secure only by our ability to offer some concession or to threaten retaliation in case our products are discriminated against. *To meet such a situation our Government must be able not only to act effectively but to act quickly.*

"*This requires the creation of adequate and flexible tariff machinery.* Congressional action is necessary, but Congress, while it must determine the policy to be followed, is by its very organization slow to move. Senators and representatives have a multiplicity of duties and even the members of the Ways and Means Committee cannot give the constant and consecutive attention to the mere machinery of the tariff, which adequate preparation for the future would seem to require. If Congress, therefore, would adopt its policy and fix certain definite limits within which the Executive should be empowered to act, the difficulties inherent in the situation might be overcome.

#### Two Possible Tariff Adjustments

"To secure the desired result, two lines of action are open. Either the general schedules should be increased, in order that concessions thereunder may be offered, or the present schedules, with such changes as may now be made, should serve as a minimum tariff, and provision be made for a graded increase on certain articles to be selected with a view to the balancing of our export and our import trade. The former alternative is manifestly impracticable. Congress, and the country at large, would be reluctant to increase all duties and remove numerous articles from the free list with a view to later granting concessions thereunder. The possibility of concessions under reciprocity arrangements is calculated to create uncertainty in the minds of business men. The second plan, therefore, seems the most feasible. The precedent for such legislation has already been established under previous revenue bills. The suggested Senate amendment to the Underwood bill, with certain amplifications, vesting in the President the power to impose a surtax on certain selected articles, or a duty on certain articles ordinarily on the free list, would give both the power to prevent discrimination by the threat of retaliation, and the possibility for quick and effective action.

"The adoption of such legislation, the creation of the tariff commission, the co-ordination of the work of this commission with the Departments of State, Treasury and Commerce, would give us the machinery which is required. If the principle of a bargaining tariff is a sound one, the necessity for the adoption of this principle is immediate."

# Automobile Industry Is Best Organized in United States

Coffin's Statement at United States Chamber of Commerce Meeting at Washington — After Declaration of War No More Than 15% of Plants in Entire Industry Could Continue Regular Work

Chamber Passes Resolutions Favoring Daylight Saving, Webb Bill and Co-operation Between Government Bureaus, Manufacturers and Business Men—Discusses Requirements for Foreign Trade and Education Needed

By Donald McLeod Lay

WASHINGTON, D. C., Feb. 2—The automobile industry is the best organized industry in the country. So Howard F. Coffin, member of the Naval Consulting Board and vice-president of the Hudson Motor Car Co., told the fifth annual meeting of the Chamber of Commerce of the United States, which closed its 3-day session here to-day. No more than 15 per cent of the factories could continue their regular work, said Mr. Coffin, in his address on National Defense, which was particularly pertinent and important in view of present international developments.

Close consideration and constructive discussion of many widely varying subjects relating to increased commercial, industrial and personal efficiency occupied practically the entire convention of the chamber with the exception of routine business.

Automobile, motor truck and parts and accessory manufacturers and engineers are vitally interested in subjects taken up by the meeting, as may be seen from a summary of some of the resolutions passed:

1—*Recommending that Congress enact legislation to move forward the clocks in all States 1 hr. for not less than 5 months each year.*

2—*Reiterating chamber's approval of the Webb bill permitting combinations for foreign trade, and requesting action on it at the present session of Congress.*

3—*Protesting against proposed method of imposing excess profit tax on corporations and co-partnerships.*

4—*Advocating closer relations between the various trade associations, the Federal Trade Commission and the government.*

5—*Urging the establishment of a supervising board of approximately five trained statisticians to direct the work of the census bureau to prevent overlapping and useless work and to insure practical presentation of useful and accurate figures.*

Other thoughts prominently brought out at the meeting were:

a—Importance of our growing foreign trade and necessity for education and preparation to meet the fierce competition that will follow the war.

b—Heightened commercial, industrial and personal efficiency to meet the new conditions.

c—Closer co-operation between government bureaus, business men and trade associations in both domestic and foreign trade.

d—Need for uniform bills of lading and uniform insurance policies to prevent fraud and to simplify handling.

e—Universal adoption of metric system of weights and measures throughout the United States.

f—Necessity for a bargaining tariff.

g—Discarding ad valorem system in tariff in favor of specific weight system.

h—Arbitration of trade disputes.

i—Need for a new commercial treaty with Russia.

j—Standardize costs through Department of Commerce.

k—Improve best existing methods in all industries.

There were 1282 delegates and guests in attendance at the meeting, as compared with approximately 960 last year. Most of the sessions were held in the auditorium of the New Willard Hotel but this afternoon's meeting was in the Pan-American Union.

## Should Move Clock Ahead 1 Hr. In Summer

Increased Efficiency, Lower Factory Costs and Healthier Workers Logical Results

SIMULTANEOUSLY with the holding of the Daylight Saving Convention in New York, the committee on daylight saving of the Chamber of Commerce of the United States reported its recommendation that Congress enact legislation providing for moving the clock ahead 1 hr. on April 1 each year and, if necessary, turning it back on Nov. 30.

Our hours are out of keeping with the hours of daylight, especially in summer, and the committee pointed out the folly and wastefulness of sleeping through hours of sunlight in the morning and then burning artificial light for several hours in the evening. These habits are probably the result of improved illuminants and changing industrial conditions. As an example of present conditions, the situation at Chicago was cited. Throughout the year at Chicago the time between sunrise and noon, the usual time of breaking the work-day, is longer than that between 1 p. m., when the second work period begins, and sunset. In December there are almost 5 hr. of sunlight before noon and less than 3½ hr. after 1 p. m. In June there are approximately 8 hr. before noon and about 6½ after 1 p. m.

Thus our workday deprives us of sunlight in a part of the day of great importance to human and consequently factory efficiency. It also interferes to a considerable extent with our business relations with Europe. Moving the clock ahead 1 hr. will substitute a cool morning working hour in summer

for a warm afternoon hour; in winter it may place breakfast before sunrise but will bring a greater amount of daylight into the working hours at the end of the day.

Increased daylight in the hours of greatest fatigue will lessen tuberculosis, reduce eye strain, increase personal efficiency and will materially lessen industrial accidents. Greater opportunities for education after work hours would be available and the entire social life of the nation would benefit. Furthermore there would be large direct savings in expenditures for artificial light, the latter an important factor to manufacturers.

Bills have already been introduced in the House and Senate and President Wilson has expressed his approval of the plan so that action during the present session of Congress is possible.

It is stated that Canada is only waiting for the United States to adopt the daylight saving plan before taking a similar step.

## U. S. A. Must Meet Europe's Increased Efficiency

### Intensive and Economical Production and Distribution Necessary in Foreign Trade

ONE of the most important committee reports was that on the Department of Commerce, which pointed out the marvelous increase in efficiency of European nations brought by war conditions as a prime factor in making these countries formidable rivals of the United States for the world's trade upon the cessation of hostilities.

The basic fact emphasized in the report is: "If we as American business men—individually and collectively—can produce and distribute with as little waste of materials, manpower and opportunity as our foreign competitors, we shall get on comfortably. If we do not, we must sooner or later suffer; for we shall be threatened and outdone in domestic markets as well as in those abroad. There is no escaping this basic issue. We may pile up wealth and gold reserves, establish scientific tariffs, negotiate the best of commercial treaties, carry on the most vigorous foreign trade propaganda, legalize combinations for exporting—we may do a hundred wise accessory things like these but unless they are backed up by a business fundamentally as efficient as that of our competitors they can give us no security."

### Europe's Labor Supply Ample

Europe has been fitting its factories with modern American automatic machinery for the quantity production of war munitions and this equipment can be equally effective for quantity output of peace products after the war. Workmen have been receiving practical scientific training and women have been introduced into industrial vocations to such an extent that the tremendous wastage of men killed and crippled in battle will not handicap these nations as the American public assumes. Practically all the women workers will continue to be at least a potential labor supply during the period of reconstruction and when the surviving three-quarters or even two-thirds of the armies are added the available supply of trained labor will be found larger than at the outbreak of the war. Moreover, the people of these countries have been schooled in self-sacrifice, their muscles have been hardened and their wits sharpened by the years of war and these things will stand them in good stead in the trade war to follow.

Co-operation, too, has made great strides in Europe. Business men work together, not against each other. Governments keep in close touch with business needs and supply them, whether for foreign or domestic trade. In England forty official committees of exports are now engaged in matters re-

lating to the maintenance of trade after the war. Similar committees are working in France, Germany and other countries.

With a view to offsetting the gains in business economy made by our competitors, the committee proposed the addition of four closely-related functions to the Department of Commerce:

1—To find out in detail what it costs to do business in the United States.

2—To deduce sets of reasonably attainable standards for the various items of expense in the various lines of business. This work, of course, would have to be done by easy stages as the facts became available.

3—To tell manufacturers and merchants how to attain the standards set.

4—To ascertain the best methods in use in each industry and to improve them.

The work should not stop here, however, as the most economical method of distribution in each case should be determined and other problems solved to strengthen our economic fabric.

### More Useful Statistics Needed, Committee Reports

The outstanding thought in the report of the Committee on Statistics and Standards was that business men need fewer statistics but of more vital import. Moreover, these should be as complete and accurate as possible and should be presented in such form that those for whom they are intended will really study and use them.

## 1 TO 2 YEARS REQUIRED TO PLACE INDUSTRY ON WAR BASIS

By Howard F. Coffin

Member Naval Consulting Board and vice-president and consulting engineer, Hudson Motor Car Co.

**T**HE automobile industry is the best organized industry in the country. After a declaration of war no more than 15 per cent of the industry would keep on with its regular work. All other industries would be affected in about the same proportion. Close observation of the experience in foreign countries has shown us the vital necessity for a prearrangement in all industries.

Wars as now waged involve every resource of a nation. Every factory, every man, woman and child is affected. Every sinew of transportation, industry and finance must be harnessed for the common good. It is upon organized industry in the United States that we must base any and all our plans for a military defense, and in the event of trouble with any of the first-class powers between 80 and 90 per cent of our industries would be centered upon the making of supplies for the government. From 1 to 2 years of time and effort are needed to permit any large manufacturing establishment to change over from its usual commercial peace-time work to the supplying of war materials. After 2 years of diligent work over 20,000 inventories are now on file in the Council of National Defense.

## Export Trade Is Now as Necessary as Domestic

Essential to Reserve on Which Home Credits Depend, Says Secretary Redfield

**EXPORT** trade is now as much of a necessity to the industries of the United States as domestic business, Secretary of Commerce Redfield told the Chamber in his address on Business Conditions. He pointed out that we are at the dawning of a new commercial era in which the role of the United States is far different from that formerly played. Industrial and commercial requirements are already changing and in the future co-operation and greater business efficiency will be necessary, while the wasteful methods at present in almost universal use in this country must give way to more intensive production. Export trade is essential to the preservation of the reserve on which our home credits depend.

Under the new conditions men of science must be welcomed into our factories, the metric system of weights and measures must be adopted and the work of the trade and technical association developed. Mr. Redfield approved particularly of the way in which the business trade associations are improving the scientific side of business by standard cost accounting systems, etc., and also of the elimination of individual selfishness in the work of these organizations.

### Foreign Trade Requirements

**ESSENTIALS** of foreign trade development in the opinion of the American Chamber of Commerce of Paris were stated by its delegate to the Chamber of Commerce of the United States, Mr. Shoninger, to comprise:

- 1—A bargaining tariff using specific (weight) system instead of the ad valorem;
- 2—More complete co-ordination of all industries;
- 3—Facilitation of banking arrangements;
- 4—Co-operation between manufacturer and exporter in establishing American selling agencies abroad;
- 5—Elimination of unnecessary intermediaries; and
- 6—Education of representatives for foreign trade work.

Mr. Shoninger pointed out that all European nations have discarded the ad valorem system in their tariffs in favor of the specific and called attention to the need for a bargaining tariff as brought out at the meeting of the Foreign Trade Council in Pittsburgh.

In discussing education for foreign trade as carried on in France, Mr. Shoninger mentioned schools covering this field which are aided by the French government though the greater part of the expense is borne by the chambers of commerce. Selected students from these schools sometimes are sent around the world to round out their education.

## Education for Foreign Trade Must Be Universal

Presents Methods Wrong for a Commercial Nation—Entire Population Must Learn

**EDUCATION** for Foreign Trade, an address by Wallace D. Simmons, president of the Simmons Hardware Co., St. Louis, emphasized the necessity for making such education a matter for the entire population of the country instead of only for a chosen few. It is a hopeful sign, Mr. Simmons said, that business men are turning to commercial, technical and industrial education as this is essential to the development of a permanent foreign trade.

Foreigners are being employed by our big business houses for export work only because there are no Americans qualified by education and experience to undertake it. Mr. Simmons advocated beginning in the primary and secondary schools more thorough teaching of arithmetic, commercial geography, including trade routes and products of the various countries, history and customs of other nations, etc. Under the present system Mr. Simmons considers that the elementary and fundamental subjects are neglected by pupils in their haste to attain more complex but less practical knowledge.

In the lively discussion following Mr. Simmons' address H. E. Miles, Racine, Wis., told of the big movement now going on in our shops and factories to increase the skill and earnings of workers which invariably results in larger profits. Automobile, engine and parts manufacturers are among the leaders in this work.

### Trade Museum for Paris—New Commercial Treaty with Russia Needed

**ESTABLISHMENT** of an American museum in Paris for developing trade between the United States and France, securing the benefit of a "most-favored-nation" clause in treaties with other countries and a new Russian-American commercial treaty were recommended in the report of the Committee on Foreign Relations.

An American trade museum in Paris would greatly benefit our commerce, it was stated, if the American Chamber of Commerce in Paris, for example, were to take the responsibility for conducting it. Such control would be necessary to insure against deterioration of the museum.

European nations after the war will favor their allies and restrict their enemies' trade. We must study these European agreements to safeguard our interests.

For the same reason the new treaty with Russia will have to wait till peace is declared. The committee recommended that, when the time to negotiate this treaty arrives, the State Department take advice of business men experienced in Russian trade. A committee of such men representing the Chamber has been available for 2 years.

### Arbitration in Trade with Argentina—Other Plans Under Way

**AFTER** reporting the successful completion of arrangements with the Bolsa de Comercio de Buenos Aires for arbitrating disputes affecting trade with Argentina, the Committee on International Commercial Arbitration stated that similar agreements are under way with the Comara de Comercio de Montevideo, for Uruguay, and urged action with the other Latin-American countries.

Practical arbitration in our trade with Argentina is especially opportune as complaints have come from that country that American exporters were not complying with their contracts and the Federal Trade Commission reports that in Latin America unfair competition against our goods and trade by European rivals frequently takes the form of calumny. Such conditions will be aggravated after the war and the arbitration plan will afford a means for adjusting well-founded complaints in accordance with their merits and by establishing and making known the facts will destroy all chance for successful calumny.

Under the plan all manufacturers and traders who put into their contracts the letters A. A. A. (American Argentinian Arbitration) can name their own arbitrators in case of disputes. Where parties fail to select their own arbitrators recourse is to the official lists of arbitrators. Proceedings occur under the supervision of a permanent committee which may intervene only in very extreme circumstances to avoid enhanced damages. If the losing party feels aggrieved

he will have opportunity to present his case to his trade or commercial organization, as the courts will not be invoked to enforce awards.

The association of the Chambers of Commerce of the United Kingdom is understood to be considering the feasibility of a similar arrangement for arbitrating disputes arising from British-Argentine trade.

### Capital and Labor Must Co-operate

**HARRY A. WHEELER** of Chicago, first president of the Chamber, delivered an address on Industrial Relations Thursday evening in which he said that the conflict between capital has placed the United States in an unfavorable competitive position.

Organized labor, he said, must come under some form of public control and organized business has had its session of unwise operations with subsequent legislative correction.

After stating that organized labor's purpose is wholly selfish, Mr. Wheeler went on to say that an organization which is promoted in business cannot be denied nor discouraged in the field of labor and even the right to strike must be acknowledged until it encroaches upon the safety of the nation and the welfare of the people.

### Latin Americans Complain U. S. A. Exploits Opportunity Created by War

**A FEELING** is prevalent in Latin-American countries that U. S. A. manufacturers and business men are exploiting the temporary opportunity for large profits due to the war without laying foundations for a permanent export trade. This significant statement was made by Dr. Leo D. Rowe, secretary-general of the International High Commission, in his address concerning that body.

South American merchants are looking forward to the end of the war and the return to commerce with Europe as an emancipation from U. S. A. methods, said Dr. Rowe. These conditions he considers are largely due to the lack of experience of U. S. A. manufacturers and business men in foreign trade and to the difficulty in securing representatives and employees with the requisite training.

The International High Commission strives for uniform commercial laws, methods and strong financial facilities in all American countries; seeks reasonable regulations for commercial travelers and aims to eliminate taxes on such representatives. Uniform bills of lading and exchange are other ends in view, together with the possibility of international coins for all American countries.

Dr. Rowe censured the failure of U. S. A. manufacturers and exporters to study the tariff classifications of Latin-American countries with which they have dealings, as ignorance of these classifications prevents them from getting the best rates. A little time spent on such matters would be repaid many times over.

### Urge Uniform Bills of Lading

**TO** insure sound and uniform bills of lading, the committee on this subject recommended a central bureau which should receive copies of all export and import bills in United States foreign trade. For this purpose an agreement could be effected with the carriers transporting goods to send copies of bills to this bureau, thus preventing the practice of issuing accommodation bills in foreign ports, if such a practice exists, as well as furnishing a protection against forgery. Several glaring cases of forged bills of lading and accommodation frauds were mentioned, the perpetrators in each case having escaped punishment.

"The one great need in connection with the form of our bills of lading," says the committee's report, "and the form of our insurance policies is uniformity." If the forms of the bills of lading are uniform, the committee thinks, it then becomes merely a question of insurance, the only requisite being that there shall be no gaps between the bill of lading and the insurance policy.

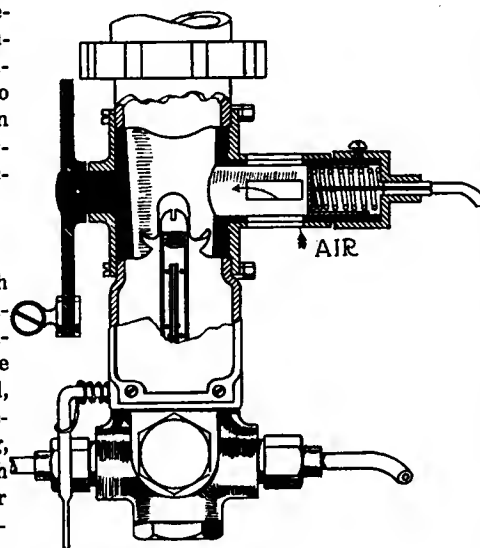
The committee recommended first, to make adequate provision against the circulation of forged bills; second, to make bills of lading and insurance policies uniform; and, when such uniform forms have been obtained, to make them permanent. This program involves a great deal of work and effort, but as the committee said: "It is worth while expending some effort to make safe the handling of five or more billions of dollars of bills of lading each year."

## Ferguson Air Control for Efficiency and Economy

**A CARBURETER** air control has recently been invented by Harry Ferguson of Belfast, Ireland, which is attachable to any carbureter. It is intended to supply additional air at such time when the engine requires it, while not interfering with any other carbureter function.

### Rich Gas for Starting

Ferguson's theory is that a rather rich gas is necessary for starting and running slowly, more particularly with modern gasoline. Similarly, a fairly dense mixture is desirable for maximum speed, but for ordinary running, from one-quarter to three-quarter throttle opening, a weaker mixture can be employed with advantage. To supply air in this way for the "middle half" of the throttle opening, Ferguson connects a tube to the throttle, which turns as the throttle lever is moved, opening ports



Claudel carburetor with Ferguson air device installed

to the air when the throttle is about one-quarter open, closing them again when it is about three-quarters open. In the illustration this is shown applied to a Claudel carburetor which has a barrel throttle, but it is equally applicable to any other kind. In the drawing the ports are shown open and within the tube there is a small piston backed by a coil spring. This is supposed to be connected to a cowlboard lever so that until the engine has warmed up the piston can be allowed to descend and cover the ports. As soon as the engine is warm the control is moved over to the open position and air is then admitted in accordance with throttle opening, as described above.

Emphasis is laid upon the fact that this cowlboard control requires no more manipulation than the ordinary choker fitted to every car and with which every automobilist is familiar.



# Car Owners and Dealers Need Education on Batteries

Service Problem Is Greatly Complicated By Their Ignorance on the Subject and Neglect of Proper Care in Everyday Use and When in Storage

EDITOR'S NOTE:—From a paper presented by J. Whyte, of the Prest-O-Lite Co., before the Indiana Automobile Service Managers' Assn.

SINCE automobilists now reach even the most remote corners of the country and insist on having their needs taken care of at all times, it becomes necessary that a battery service organization be of considerable magnitude. Almost any garage in any part of the country is able to give service on the mechanical parts of an automobile, but there is a deplorable lack of knowledge on the part of the average automobile mechanic as to the principles involved in the operation of a storage battery. This may not altogether be an unmixed blessing, because no knowledge at all is very considerably better than a little knowledge when applied to the possibility of tinkering with a storage battery.

This same point, however, complicates the conditions of building up a successful service organization in the storage battery field, because it renders the finding of experienced representation for a battery service station difficult. In the majority of cases, it is necessary to put these men through a course of training and educate them for this work before satisfactory service stations can be operated.

## Frequent Inspection Necessary

Prevailing conditions also further necessitate that frequent inspection be made in order that the service rendered be maintained at a high standard. The maintenance of a uniform grade of service is a comparatively simple matter for the direct branches of the manufacturer, but requires considerably more attention where service stations owned and operated by independent individuals are involved.

The use of the lead storage cell in the electrical industry, as a means of storing energy, is comparatively old, but the majority of its applications were confined to central station work or what might be described as semi-portable use. Under these conditions the batteries gave very satisfactory performance and fairly good efficiency. They were, of course, subjected to expert and careful attention and, by constant watchfulness, troubles by being anticipated were rendered infrequent. Batteries applied in this way also worked comfortably within their capacity.

The application of the storage battery to vehicle propulsion was the forerunner of the modern electric and here the battery was of reasonable size, the discharge rates were not excessively high, and the battery was taken care of as being a vital part of the machine.

## Growth of Battery Problem

With the application of the storage battery to starting duty in 1912, battery manufacturers were met with the problem of obtaining the maximum capacity from the minimum amount of weight and were also faced with the fact that their product was being turned into the hands of men who were accustomed more to handling mechanical devices than an electro-chemical unit which was sensitive to abuse and neglect.

In its application to starting and lighting work, the storage battery does not operate under the most favorable con-

ditions. It is subjected to heavy discharges and also in many cases to continuous overcharge for prolonged periods.

## Owners Neglect Battery

While the average automobile owner appreciates the fact that the entire mechanism of his car must receive constant care, attention and periodical adjustments in order that it may continue to give him satisfactory service at all times, there seems to be an unfortunate habit among owners to leave the entire electrical equipment of the car severely alone. The result of this is that if any irregularities should develop in the operation of either the starting motor or the generator, unless they are of such a serious nature that they put either unit out of business entirely, they are not given the attention they deserve.

Since the storage battery is the most sensitive unit in the entire electrical equipment, troubles which develop elsewhere usually show up first in their effect on the storage battery and are immediately diagnosed as battery trouble.

The wide variation of operating conditions also constitutes a difficult problem. Some owners on account of their vocation find it necessary to make repeated demands on the starting equipment, because it is necessary for them to stop and start frequently in the course of a day. Others are so situated that they use the starter infrequently and at the same time make long cross-country drives at considerable speed.

The conditions existing in the first case are such that there is every possibility that the amount of current drawn from the battery by frequent starting, will not be returned by the generator, since the amount of driving done between stops does not allow sufficient time for the generator to return the energy that has been withdrawn from the battery. If in addition any considerable amount of night driving is done, the entire situation is further aggravated.

In the second condition a very little current is drawn from the battery for starting purposes and a considerably larger amount of energy is returned to the battery than has been withdrawn for starting purposes.

On analyzing these conditions it is found that in the first case the battery slowly becomes discharged and finally reaches a point where it does not have enough energy to turn over the motor. This condition can be avoided by making frequent hydrometer readings of all the cells in the battery, and when the specific gravity shows that the battery is approaching a discharged condition, it should be removed from the car and charged from an outside source.

## Prolonging Battery Life

Taking precautions of this nature will considerably prolong the life of the battery and eliminate the possibility of it falling down, probably at a time when it is most required.

Too much attention cannot be paid by motor car makers to the matter of drawing the car owner's attention to the addition of distilled water. "Leave it alone" may be a good

doctrine for the rest of the system, but it spells ruin for the battery.

In some cases car makers place in a prominent position on a car a small name plate, advising the owner not to neglect his storage battery. On new cars again a good many makers tie a tag to the steering wheel bearing a notation which brings to the owner's notice immediately he receives the car, subject matter relating to the care of his storage battery and warning owners as to what may happen if they neglect to take the precautions that are outlined for their benefit.

#### Ignorant of Battery's Existence

It is scarcely believable, but nevertheless true, that there are a considerable number of automobile owners who do not even know where to find the battery on their car. The first time they realize its existence is when they try to use it and find it discharged. The car manufacturer and automobile dealer should take strenuous steps to correct this condition of things.

Every dealer should have in his possession a hydrometer and should educate his customers to its use and value, not only because it will help his customers, but also because it will ward off considerable annoyance to the dealer himself through the avoidance of battery troubles.

In spite of the continuous advice given in all literature on battery subjects to add nothing but distilled water to the battery, numerous cases are on record where owners will add anti-freeze to their battery during cold weather the same as they do to their radiators in ignorance of the fact that distilled water is the only thing that should ever be added to a battery, except by an expert battery man. Many dealers are no better posted, although our experience goes to show that most of them are willing to learn.

Examination of batteries from cars that are thus subjected to lack of care will usually show that they have never received any water and that the plates are absolutely dry, a condition usually resulting in the formation of injurious sulphate which in turn is very hard to break up and may necessitate an entire plate renewal.

If this same owner had attempted to use his motor without supplying it with the necessary lubricating oil, he would not have been at all surprised to have the motor burn up with him on the road; yet he is surprised that his storage battery should fail to perform its functions irrespective of whether it is cared for or not.

#### Adjustment Is Required

The close relation existing between starting and lighting units and the storage battery has already been mentioned, but the relation is important enough to justify further attention. One of the most prolific sources of battery trouble is that caused by irregularities outside of a battery itself. No mechanism can be expected to run indefinitely without adjustment. This applies not only to mechanical devices, but also covers electrical machinery and therefore the starting and lighting system of an automobile. Motors, generators, switches, regulators and wiring must be subjected from time to time to examination and possible troubles anticipated.

A regulator out of adjustment may cause too high or too low a charging rate with corresponding overcharge or undercharge of a battery.

Shorts in the wiring, switches or starting motor may allow a slow current leakage which will cause the battery to run down and become discharged.

At the same time owners should be encouraged to take their cars for inspection at frequent intervals to a battery service station. When on examination indications are found which would seem to point to the possibility of other parts or the electrical equipment being out of adjustment, the car

should be taken immediately to the dealer and the electrical equipment gone over carefully with the idea of avoiding possible irregularities that would lead to trouble.

#### Coaching the Owner

Some dealers send a letter to car owners the day following that on which the car is delivered, calling the attention of the owner to the existence of his storage battery and the necessity of adding distilled water and otherwise exercising a reasonable amount of care with this particular part of the car's mechanism. This is perhaps in a way a defensive measure on the part of the dealer, but is enormously helpful in getting the owner to take care of his battery and thereby derive the maximum satisfaction from his electrical equipment.

There is an unfortunate attitude exhibited by a great many owners when they do have battery trouble, irrespective of the cause, in which they seem to feel that it is no fault of their own, and in many cases they adopt the attitude of being held up for repair charges. As a matter of fact there is no group of men who have the interest of the automobile owner more at heart than the manufacturers of storage batteries. Further, their interest in the welfare of an owner's storage battery is sincere because they realize that the interest of the owner and the manufacturer are coincident.

#### Education Is Needed

They realize further, that as in the early days of the automobile industry, the owner had to be educated in the care of his car so in these days of storage batteries, the owner must be educated in how to care for his battery and its co-operative units in the electrical system. This educational work is being carried on on a large scale by storage battery manufacturers and at the expenditure of considerable sums of money. Battery makers are more than willing to bear their share of the expense involved in thus educating the automobile dealer and owner to a knowledge of how a storage battery operates, and the care and attention necessary for its welfare, because this is the vital necessity at the present time, in order to eliminate the majority of troubles at present experienced with batteries. They realize that the result of such educational work will be the better performance of the storage battery in its application to automobile work.

There is a condition which is at present causing grave concern to the makers of both automobiles and storage batteries and one which exists because of the perishable nature of a battery.

In these days of large production of cars, there exist periods when the available market for the disposal of cars does not equal the rate at which they are being produced.

This necessitates that cars be held in various quantities in different parts of the country over the winter months, in order to take care of the spring sales without any delay in deliveries.

#### Storage Complicates Troubles

If cars are shipped in the fall of the year equipped with storage batteries and these are held at the various sales points until spring without the batteries having been removed from the car and properly taken care of, the majority of these batteries are going to depreciate very rapidly as soon as they are placed in service.

This unfortunate condition is directly traceable to the very nature of the storage battery and creates a situation which may develop to be possibly unfair to the buyer of the car.

Every automobile dealer cannot reasonably be expected to install equipment and the necessary skilled labor in order to take care of the storage batteries over this period of time and in this condition we face one of the most serious problems

that has come up for some considerable time in order that we may render reasonably good service to the automobile owner.

Co-operation Is Necessary

This affords a problem that requires co-operative measures to be taken by both automobile makers and storage battery manufacturers, in order that some common ground may be reached whereby the owner of a new car is insured a battery in condition to give satisfactory performance. Under existing conditions the dealer should at least be cautioned by the car maker to see that the batteries on cars thus held over are charged approximately every 30 days, or that the batteries are removed from the cars and turned over by the automobile dealer to a competent battery service station for winter storage under proper conditions.

Educational Campaign Imperative

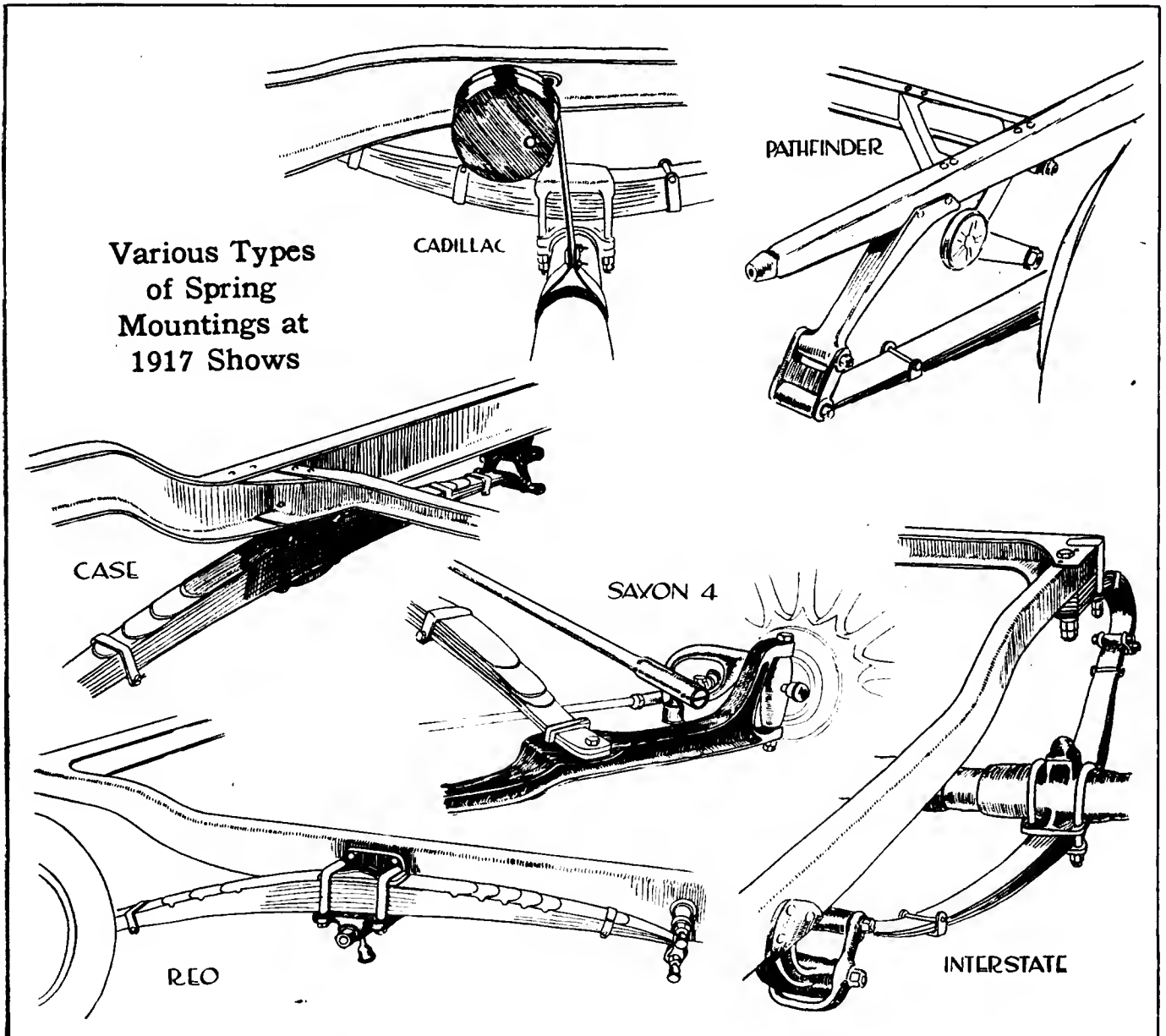
To sum up the entire situation the hardest work that is ahead of us at the present time is to conduct an enormous educational campaign, not only through the medium of advertising and distribution of literature, but also by soliciting the co-operation of the dealers and, where required, having first educated them, have them educate their owners to the

necessity of taking care of not only the storage battery, but also the units with which it must work in harmony.

This is the situation in which the automobile maker can help enormously, because while a progressive dealer is out for all the information he can obtain and undoubtedly pays considerable attention to literature received from parts makers it cannot be denied that information coming to him through the medium of the automobile manufacturers, whose product he may be handling, carries more weight than any information that he may receive from another source.

Problems of Entire Service Field

The problems that are facing the storage battery manufacturer in order that he may give efficient service are not his problems alone, but are of vital importance to everyone connected with the service end of the automobile industry and the present discussion and lively interest that is being taken in the subject are altogether encouraging to those whose duty it is to designate how the situation will be handled. It is to be hoped that the interchange of ideas in regard to this matter will result in at least the pointing out of a possible way toward the solution of the problems, which will be mutually acceptable to car manufacturers, dealers and owners and also to the storage battery manufacturers.





# The FORUM



## Plain Tube Carbureter Satisfactory at All Speeds

By R. A. Leavell

*Assoc. Prof. of Mechanical Engineering, Iowa State College.*

ON page 1025 of THE AUTOMOBILE for Dec. 14, 1916, I note the following statement concerning the air valve type of carbureter:

"Included in the air valve types are the Zephyr, Air Friction, Browne, Branford, Breeze, Shain and K-D. Of these, alterations have been made during the year by Zephyr and Air Friction. The Branford, which at present is supplied only in the Ford size, will be made in all sizes after Jan. 1, 1917, without change in principle.

"The air valve carbureters are probably the most simple of all types. Either automatically or mechanically an auxiliary valve opens at higher speeds, decreasing the richness of the mixture to take care of the needs of increased speeds. Primarily, the auxiliary air valve is necessary to relieve the vacuum at the main jet caused by the increased velocity of the air current. As engine speeds increase beyond 1000 r.p.m. the auxiliary air valve becomes necessary, and it was from this type that the inspirations for the more complicated automatic devices were drawn."

It is the writer's experience that carbureters of the plain tube type with proper arrangement for compensation of the nozzle flow can be made to furnish a uniform quality of mixture with engine speeds even three or four times the limit which you place. A number of racing cars on the speedways last season were equipped with plain tube carbureters which seemed to give almost a uniform quality of mixture even at very high engine speeds.

Inspection of the quality of the exhaust issuing from an engine when it is being operated on a dynamometer test or probably better yet exhaust gas analysis can be made to show definitely that a plain tube carbureter properly designed can give a uniform quality of mixture up to the highest engine speeds which can be obtained with safety.

## Prefers Magneto

By J. O. Brouillet

BEING a most interested party as to which is the better, battery or magneto, for automobile ignition, I have closely followed the different articles and arguments that have appeared in the magazines and papers from time to time. And I see by a recent editorial in THE AUTOMOBILE you are of the opinion that this matter is to remain in the balance for some time to come. But through my business I have learned that the fact is that if this matter were put to a vote of the automobilists who had experience with both, the magneto would come out far ahead.

In the last 2 years, through my business, I have met not less than 5000 automobile owners who, having had experience with battery ignition, magneto, and battery again, all of them were well equipped to judge as to what is the best in that line. Without solicitation all of them have shown and expressed their displeasure with the battery, some in very strong terms.

Many who have the room, and whenever it is possible, are taking off the timers and putting on magnetos. One firm has changed over three. Others having several machines are do-

ing the same, and this is not saying anything of the large number of individuals who have come to see me in regard to changing over.

The salesman for one make of car who changed over from magneto to battery, in a talk with me and others was very frank; he said that his company was not doing it as an improvement, but for cheapness. Others closely allied to the automobile trade wanted to know what I had heard people say in regard to all these systems, as for themselves they preferred the magneto.

During one of the shows here, I stood by where a salesman was trying to sell a car of one of the prominent makes equipped with a battery system. He did not sell the car because the prospective buyer was an experienced man, and he wanted one with a magneto.

### Suggests a Vote

Now in view of the fact that the foregoing are all very much alive facts, gathered right from sources, and those most concerned, it proves quite conclusively what is best and wanted.

Why not put it to a vote, only those having experience with both systems being entitled to vote?

## Wire Wheel Patent Decision Affects England Only

By Milton Tibbetts

*Patent Counsel, Packard Motor Car Co.*

THE statement on page 199 of THE AUTOMOBILE for Jan. 25 relative to detachable wire wheels is not exactly correct. The report is dated from New York, but refers to a court decision relative to a British patent. It states that "any person is free to manufacture detachable wire wheels."

I think your statement should have been qualified to the extent that the decision in question affects the situation only in England and has nothing whatever to do with United States patents. It particularly has no effect on the Packard company's Cowles patent No. 1,103,567, application for which was filed in 1901, some years before the date of the British Napier patents referred to. This Cowles patent has claims broadly for detachable and interchangeable wheels, which is, of course, the way practically all wire wheels are made.

Perhaps your readers will be interested in this qualification to the statement published.

—Mr. Tibbetts is correct. The decision applies only to England.

## Using Fuel and Oil Mixed

By John W. Few, Jr.

THE following appears in the *Monthly Bulletin*, a magazine of one of the automobile clubs:

"For increasing the efficiency, taking out the knocks on hills and making what the builders call a 'sweet running engine,' add one pint of cylinder oil to every gallon of gasoline."

I know this was the way to lubricate two cycle engines but did not ever hear that it improved the run of four-cycle motors. Is there anything against the practice? Will you please discuss the subject in The Forum.

# Worm-Gear Theory and Practice

## Part III

*THIS is the third of a series of articles extracted from the paper recently delivered by F. W. Lanchester before the British Institution of Automobile Engineers. This paper is of such length that it practically amounts to a text book on the subject. While it deals particularly with the advantages of the Lanchester or Hindley type of gearing, the portions devoted to worm and wheel mounting are applicable to the parallel type of worm gear also. It will probably rank as a standard work of reference for years to come.*

THE experience of the Daimler Co., though dating from more recent time, is considerably wider than that of the Lanchester firm, inasmuch as the range of sizes and standards as defined by the different centers and ratios of gear is far greater; the applications range from the lighter types of passenger vehicles, both petrol and electric, to the heaviest type of motor truck, namely the 5-ton vehicle.

### Daimler-Lanchester Layout

The whole range of the Daimler-Lanchester worm gear standards is laid out diagrammatically to scale in Fig. 19. The different standards of blank are designated by the capital letters A, B, C, etc., in the order in which they were initially established. Types A, B, C, F and K have been produced for private pleasure cars, etc. Types D and L more particularly for electrical vehicles (supplied mainly to the U. S. A.). Types H, J, and O for commercial heavy vehicles, and type G for particular application to (stationary) power transmission.

Thus, in greater detail, type B, 6-in. or 152 mm. centers, is that used almost universally in full weight touring cars, limousines, etc. Type K, 137 mm. or 5 7/16-in. centers, for cars of, say 20 hp., weight not exceeding 3500 lb. gross. Type F, 120 mm. or 4 3/4-in. centers for cars of, say, 16 hp., not exceeding 3100 lb. gross.

The types H and J, 7 3/4-in. or 196 mm. centers, are for 3-ton trucks, but chassis and the like. Type O, 9-in. or 228 mm. centers, is for the heaviest road vehicle at present in ordinary commercial use, namely, the 5-ton truck.

A typical mounting for the A and B standards of gear is illustrated in Figs. 20 and 21. There is little to be noted

here except the self-adjusting spherical thrust bearings which prevent undue or unevenly distributed stresses on the thrust bearings as plausibly due to any slight "whip" or spring of the mounting or want of alinement. Contrary to the Lanchester Co.'s practice, also, it may be noted that the road wheel thrusts are taken independently of the differential box mounting.

Figs. 22 and 23 illustrated the mounting adopted in the 20 hp. Daimler chassis. In this mounting the worm is on top, and the worm box is cast integral with the main portion of the gear box. An interesting feature in this mounting is the fact that the thrust is placed adjacent to the worm itself, and the bearing is placed beyond. This inversion of the usual order results in a bigger bending moment on the worm shaft, but there is ample strength to carry this. The advantage lies in the fact that as designed there are, including the worm, only five parts in the mechanical circuit, if we regard the variation in ball diameter as negligible. These are the worm, the thrust half bush, the thrust live ring, the thrust fixed ring, and, finally, the gear box casting. Thus, the total variation in the location of the worm is the sum of five tolerances, or, as already expressed, there are five elements in the mechanical circuit. This may be considered a distinct advance in worm gear mounting as a step to securing interchangeability.

Figs. 24 and 25 show the G standard mounted as a fixed transmission—as such it has been applied for the driving of air compressors, etc., and other slow running plant from electric motors. It is good for 150 hp. at 1000 r.p.m. of the worm shaft.

It may be noted that the Daimler company's standard

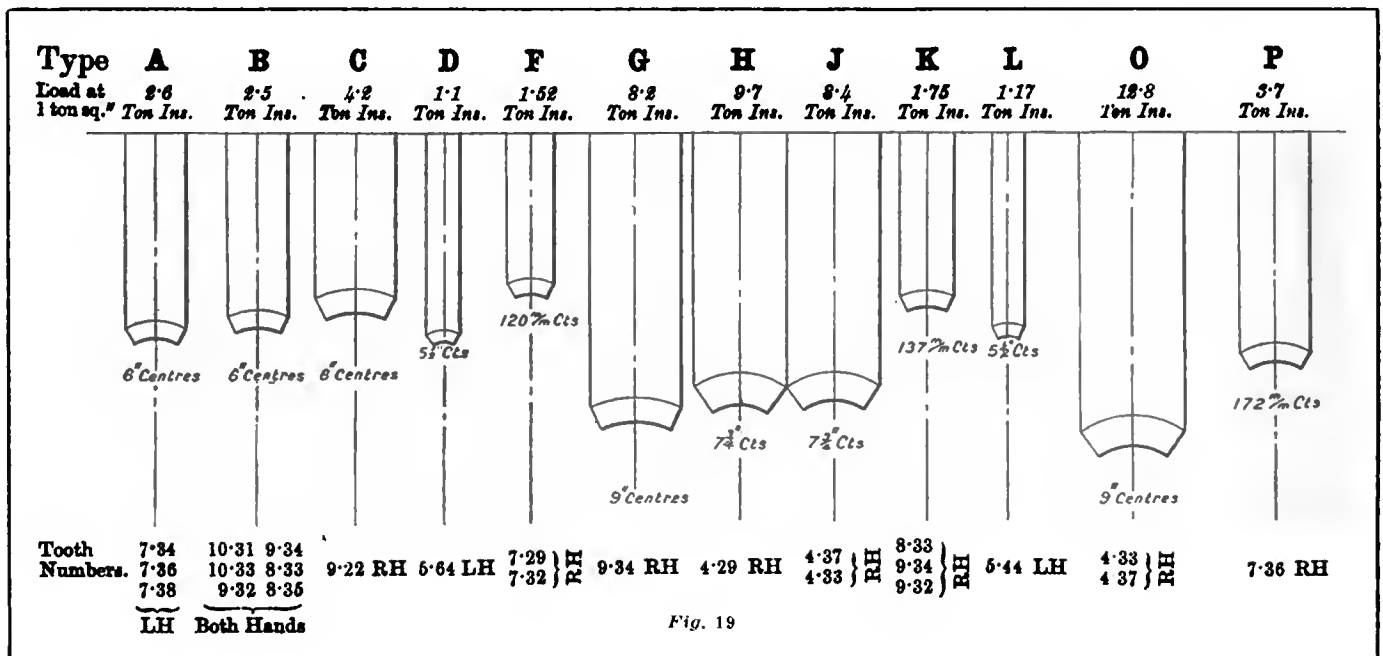
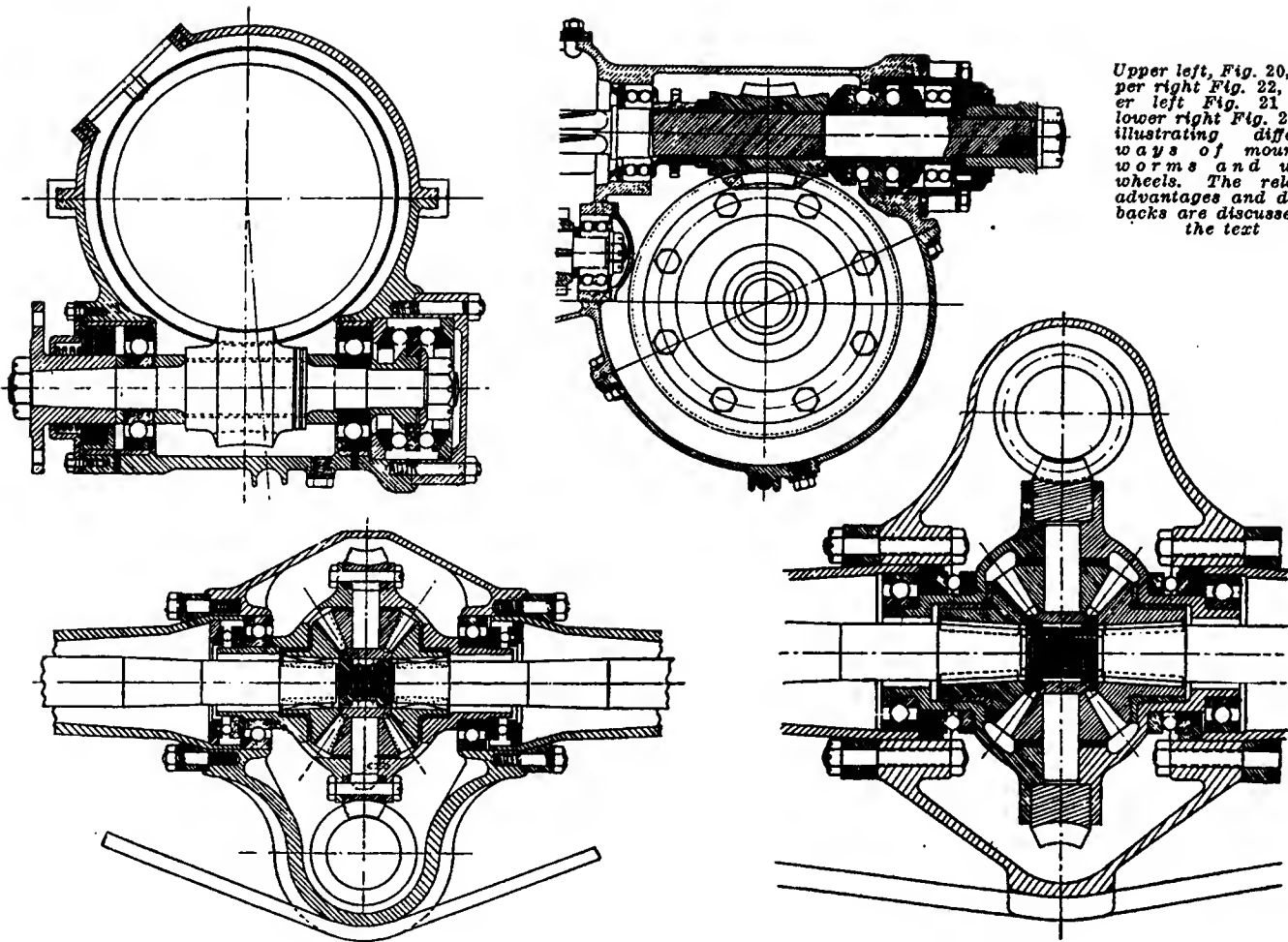


Fig. 19



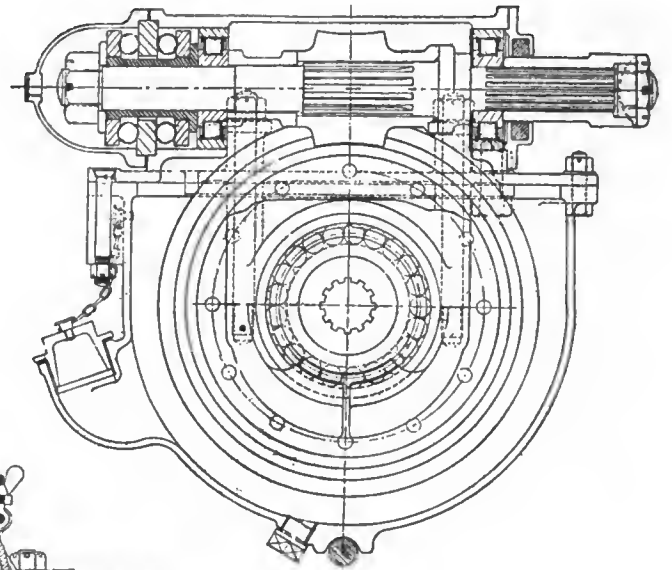
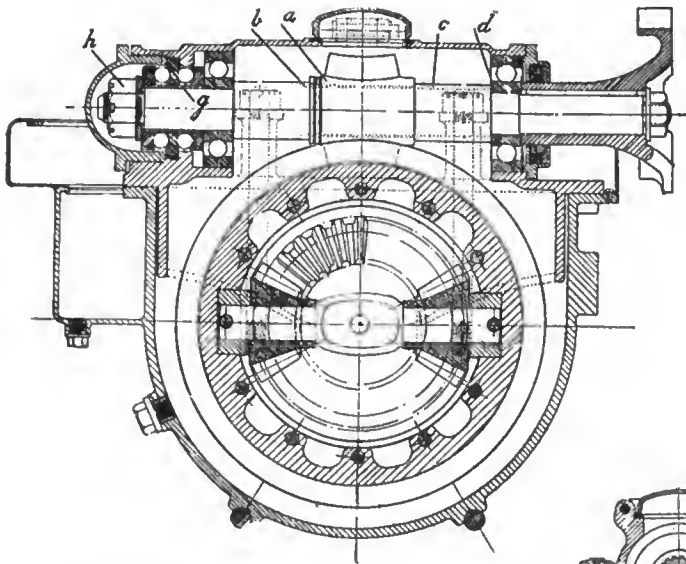
Upper left, Fig. 20, upper right Fig. 22, lower left Fig. 21 and lower right Fig. 23 all illustrating different ways of mounting worms and worm wheels. The relative advantages and drawbacks are discussed in the text

types for commercial vehicles (trucks, buses and the like) are of a heavier type, and, generally speaking, of considerably lower gear ratio than those for passenger vehicles, the difference being mainly due to the slower speeds commonly in demand and the larger diameter of the road wheels necessary for the duties in question, coupled with the fact that the engine speed is not proportionately lower.

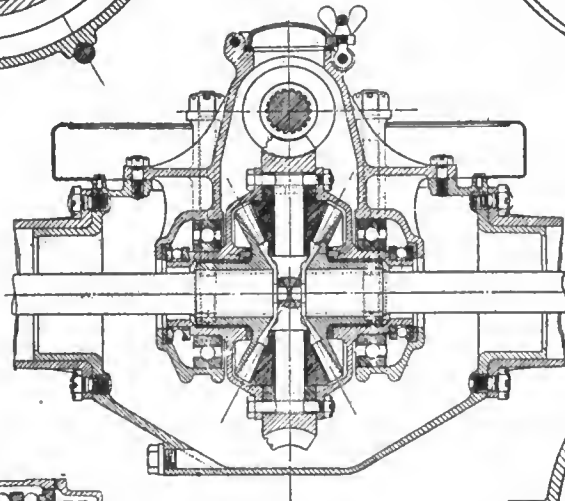
It may be said that in the application of worm gear to commercial vehicles the conditions are on the whole more exacting than in the touring car. The driving mechanism is rarely so refined, and the driver himself is not usually so fastidious. Beyond this, the loads are heavier, the tires less yielding, the suspension stiffer, and generally all the conditions which tend to "hustle" the gear exist in a more aggravated form. In consequence of this, it might be supposed that all the precautions which have been enumerated as tending to secure solidity of the worm shaft assemblage in the pleasure car will be at least as important in the heavy commercial vehicle; experience has fully justified this anticipation. It is absolutely necessary that the compression parts and thrust surfaces between the various components of the assemblage, namely, worm, spacing collar, roller race, thrust washer, etc., should be of ample area and on no account must they be left soft. As exemplifying points of good and bad design in this respect a comparison may be made between Figs. 26 and 27. In Fig. 26 a poor design of worm assemblage is illustrated, in which the defects are intentionally exaggerated; in Fig. 27 a design is given showing the proportions and precautions necessary to ensure success. Referring to Fig. 26, it will be seen that the thrust surfaces between the spacing pieces at *a*, *b*, *c*, *d*, etc., are of insufficient area. So far as concerns the taking of the necessary thrust reaction, they might with justice be regarded as more than ample; for example, at the point *d* the area of the contact faces is more than a

square inch, and may be taken as safe in compression for a force of 10 tons—the actual maximum load is not more than one-third and one-fourth of that amount. As a matter of experience, however, no such design will stand up, the faces in contact are found to undergo punishment and sooner or later backlash will develop, and the failure of the mounting follows in a very short time. The author has actually seen a case of this kind in which the one part has eaten into the other to the extent of some 3 or 4 mm. and the worm has had to adapt itself to an axial displacement of that magnitude; this can hardly be described as fair or proper treatment. When asked how to account for such failures taking place, considering the comparatively light thrust load per square inch carried by the faces in contact, it is fair to say that cases of even admittedly defective design do sometimes stand up; a certain percentage of output will not be reported as giving trouble. The truth probably is that the failure occurs through a little initial "slack" or backlash creeping in, either from careless mounting, due to insufficient initial pressure being put on by the retaining nut, or as consequent upon some slight defect in material or by bad or rough handling at some time or another. What has to be remembered is that a mounting which is not open to inspection (without virtually dismantling an axle) must be so designed and constructed as to be reliable even under the most unfavorable conditions; the need for large face contacts and hardened surfaces on which the author is insisting is thus based on experience of what *is* rather than on calculation as to what *might* or *should* be.

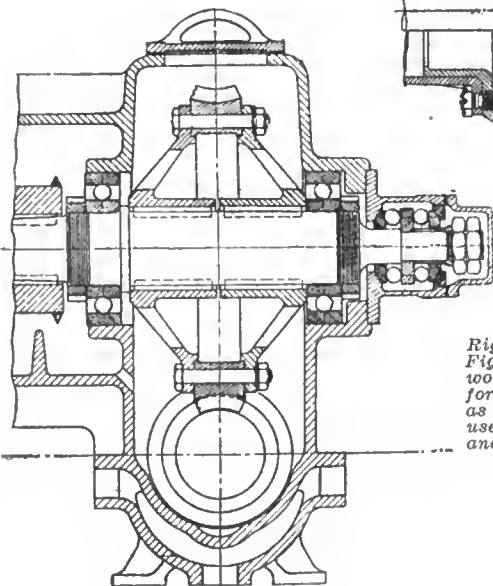
A further defect in the design shown in Fig. 26 is the thin distance tube *g* on which the double thrust bearing is mounted; it has been stated that the end nut *h* must be thoroughly tightened in order to secure the assemblage; if, as drawn, too much force were applied, the tubular spacing



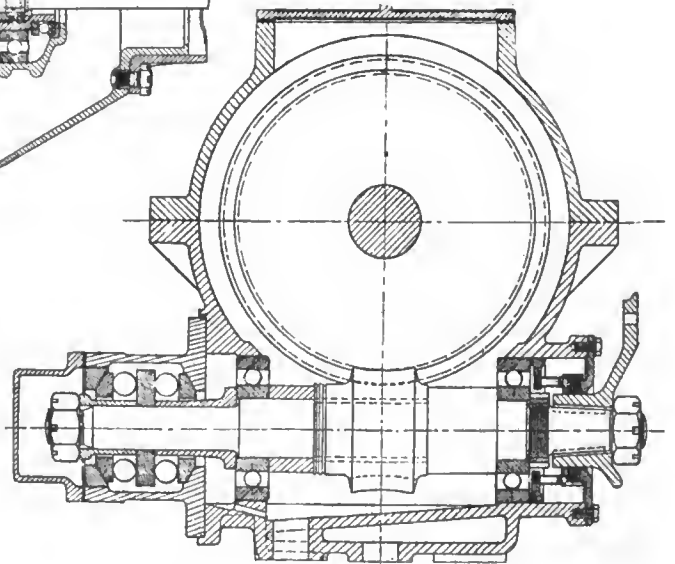
Above at Left—Fig. 26. Right—Fig. 27—The former shows a mounting which the author criticises severely and the latter a better design



Center—Fig. 28—A design of rear axle in which the worm is mounted on a very large number of very small splines



Right—Fig. 24. Left—Fig. 25—Sections of a worm gear assembly used for stationary work such as elevator service. It uses gear G of Fig. 19 and is good for 150 hp. at 1000 r.p.m.



piece would be liable to be crushed and unknown forces would be brought to bear on the thrust bearing itself, with the imminent risk of its failure—involving the usual undesirable consequences.

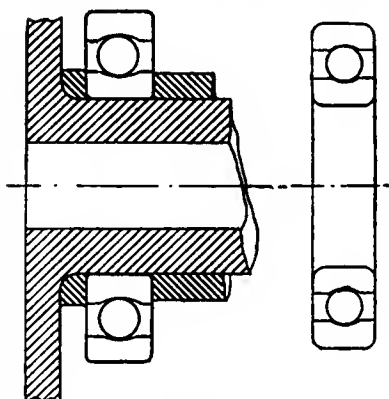
On referring to Fig. 27 it will be seen how much greater is the area of the faces provided, and generally what a far more secure job has been made of the worm location. Instead of the worm itself being held on one portion of a shaft and the thrust being held on another portion of the shaft, so that if either of two fixings come slack the worm develops backlash, we now see the worm and its thrust all held up solid on one section of the worm shaft, so that its location depends upon one fixing in place of two. Also the end face of the worm by which the brake thrust is taken is of increased diameter and bears direct on a face formed on the shaft itself.

In Fig. 27, the system (to which reference has previously been made) of an *accommodation piece* is employed to overcome the difficulties of interchangeability, the piece in question, taking the form of a sleeve on which the double thrust is mounted; the accommodation piece is more precisely formed

by the flange of this sleeve, which constitutes a spacing piece between the roller bearing inner race and the first thrust washer, and its thickness is varied to correct for the combined inaccuracy of the width of the roller race and the thrust bearing dimension. It is, as before remarked, one of the troubles with which the constructor is faced that the makers of roller and ball bearings will not go to the trouble of working within decently fine limits; it has been reported that in the particular combination of roller and ball thrust given in Fig. 27 the variation between one sample and another is commonly (on an average) as much as 0.25 mm. Personally, the author is strongly in favor of dismantling all bearings as they come from the makers and rectifying their important dimensions so as to secure complete interchangeability; however, neither the Lanchester company nor the Daimler company has yet taken so drastic a course; the system of the *accommodation piece* has been taken as the simplest way out of the difficulty. No accommodation piece is wanted to correct for inexactitude on the part of the motor car manufacturer; this is evidenced from the fact that the present procedure is that the bearings are taken to the view

room and are "married" in sets, one roller bearing and one ball thrust, and the accommodation piece, the sleeve, is ground to whatever thickness is required in its flanged portion to bring the dimensions accurate between the points *g* and *h*; no similar pairing or grouping of parts is needed in the case of those for which the automobile manufacturer is responsible. It is quite clear from this that the attitude of the bearing manufacturer is quite preposterous, and we may look to his speedy reformation when the number of firms supplying ball and roller bearings have an output in excess of the demand; it is usually waste of time arguing with a man who has ready to his hand a bigger market than he can fill.

Another feature in which the makers of ball and roller bearings have much to learn before the goods in question cease to be a trouble to the designer is that of the *radius* which it is customary to put on the edges of the bearing races. This is too little, and results over and over again in a designer having to arrange an additional piece in his design in order to adapt the bearing to the shaft on which it is to be mounted. What is far more serious is that in many cases draughtsmen have been led to design shafts with comparatively sharp corners at collared portions *in order to suit the bearing*. It would be the best course mechanically to pass



Left—Fig. 29. Right—Fig. 30

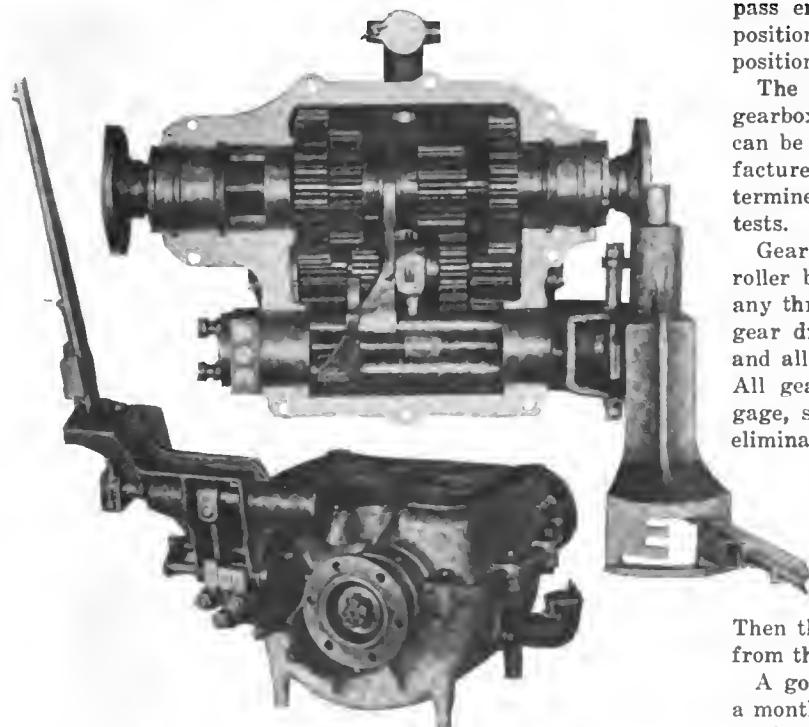
the bearings through an extra process and appropriately increase the radius to suit the needs of the shaft neck design, but there is always the danger that this might be neglected, especially in garage work where the bearing is, often enough, obtained direct from the manufacturer instead of through the car builder. This is one of the evils not so much felt in worm mountings (where more often than not the bearing is placed between two collars) as it is in other applications of the roller or ball bearing, but occasions frequently occur, and the point is one which merits attention.

In Fig. 29 we have a ball bearing as commonly turned out with its radius of only  $\frac{3}{32}$  in.; the shaft neck to take this bearing would have to be almost sharp in the corner. The figure shows this bearing accommodated by means of a collar or washer to a properly designed shaft neck. Fig. 30 illustrates what this bearing should be from the point of view of the automobile designer. The author fails to see any reason why a liberal radius as illustrated should not be adopted by the manufacturers of bearings. In fully interchangeable work any additional piece in the mechanical circuit, as in Fig. 29, means a fining of the limits of manufacture with an accompanying all-round increase in the cost of production.

## Cross Constant-Mesh Four-Speed Gearbox for Trucks

A NEW constant mesh four-speed gearbox especially intended for motor truck and bus chassis has been brought out by the Cross Gear & Engine Co., Detroit. The design is comparatively new in this country, although approximately 10,000 gearboxes of this type have been used in the service of two bus and taxicab companies in Europe.

The company claims that this gearbox is the shortest of its type, with four speeds in reverse and a capacity up to 5 tons. It was brought out in response to an increasing demand for four-speed gearsets with 1 to 1 ratio on high for trucks.



Cross four-speed constant mesh gearbox for commercial vehicles

The gear ratios employed are standard with European practice; that is, geometrical progression 1 to 1; 1 to 2; 1 to 3; 1 to 4 and 1 to  $4\frac{1}{2}$  on reverse. These ratios were adopted after a great deal of experiment by European manufacturers as most suitable for truck and bus work.

### Special Locking Device

The gearbox incorporates a special locking device which is claimed to be absolutely positive in action; two of the shifting fork shafts are held in position by locking pins which pass entirely through the shafts and hold them in neutral position while the third shaft is shifted into the required position.

The shifting lever is mounted directly on the case of the gearbox and is arranged for right-hand control, although this can be varied to suit the specifications of the chassis manufacturer. The pitch and width of face of gears has been determined after a great deal of experimentation and severe tests.

Gears and shafts are mounted entirely upon unusually large roller bearings, so that ample provision is made for taking any thrusts and radial loads set up by either chain or worm gear drive. The cases are made from direct steel castings and all parts such as shifting levers, forks, etc., are forged. All gears are renewable separately and made to accurate gage, so that one gear will interchange with another, thus eliminating the necessity of buying complete sets, a material advantage to the user.

### Easy to Disassemble

Ease of disassembly is a feature, as the gearbox can be taken down very quickly by unfastening the ten bolts securing the upper and lower cases together. Then the lower half containing all the gears can be removed from the car.

A good grade of heavy lubricating oil renewed about once a month is the lubrication recommended by the manufacturer of the gearbox.



# ACCESSORIES

## Boyce Moto-Meter for Overlands

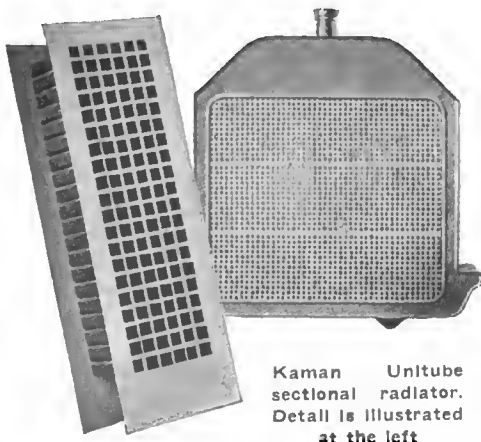
**T**HIS Moto-Meter is a model designed for the Overland car. It is only necessary to remove the screw which secures the radiator cap to the radiator and to enlarge the hole to  $\frac{1}{2}$  in. The construction is standard, with the exception of the stem, and will be part of the regular equipment of all 1917 Willys-Knight cars.—Moto-Meter Co., Inc., 148 West Fifty-second Street, New York.

## Ben Jack

This jack operates on ball bearings which support the weight at the base. It is actuated by turning a folding handle to the right or left. This handle locks to the receptacle on the jack, eliminating the necessity of reaching under the car in order to put the jack in position. The construction is such that a spiral screw engages with dogs on the lifting bar and operates by a gear with pinion. There is no reverse lever. To raise or lower the jack the rotation of the handle is reversed. All the working parts are enclosed in a solid, waterproof outer case and are packed in green. Price, \$6.—Wagner-Hoyt Electric Co., New York.

## Unitube Sectional Radiator

This radiator is built up from several sections, any one of which may be removed, repaired or replaced without interference. The elements are square brass tubes whose lengths are the thickness of the radiator, and which are joined at each end to a sheet metal header about  $\frac{1}{16}$  in. apart. The water circulates around the outside of the tubes; the air passing through the inner opening. A temporary repair may be effected by corking the ends of a defective tube, and a permanent repair may be made simply by replacing the tube. It is



Kaman Unitube sectional radiator. Detail is illustrated at the left



Boyce Moto-Meter for Overland cars, showing method of mounting



Ben jack, which operates on ball bearings supporting the weight at the base



Hytork starting and lighting storage battery

claimed that freezing has no harmful results, as the tubes are pressed inward instead of expanding and bursting. Price, Ford Special, \$30.—Unitube Auto Radiator Co., 1139 University Avenue, Rochester, N. Y.

## Hytork Storage Battery

The plates of this storage battery are designed and constructed for high efficiency and durability. The grids are made from an alloy of lead and antimony so proportioned as to produce a rigid and workable grid. After filling with the plate-composition, they are placed on an electrical charging board and given the positive or negative charge. It is claimed that the resulting plate may be bent until the grid breaks without disturbing the active material. Price, 6L-80, thirteen plates, \$27; 12-40, seven plates, \$34; 18-40, seven plates, \$44; 24-27, five plates, \$45.—Heissler Storage Battery Co., Chicago, Ill.

## P. B. B. Assembly for Fords

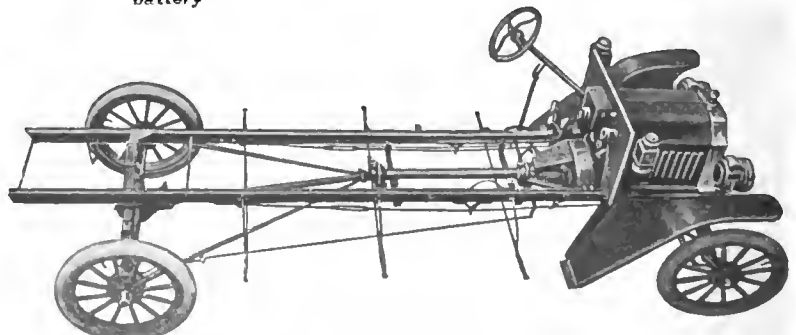
A Ford chassis may be extended to 124-, 130- or 136-in. wheelbase and converted into a 1200- or 1500lb. truck. The frame is extended by inserting two channel-iron extensions, the driveshaft is lengthened by means of a horizontal inclosed shaft provided with two universals, and all necessary parts for making the attachment are included in the equipment.—Greb Co., 196 State Street, Boston.

## Rapid Shine

Besides keeping the varnish of a car in an elastic condition and removing discolorations, this liquid preparation is claimed to leave a dry polished surface. Price, in gallon bottles, \$3;  $\frac{1}{2}$  gal., \$1; 12-oz. bottles, 50 cents.—Schroeter Bros. Hardware Co., 717 Washington Avenue, St. Louis.

## Blitzen Rectifier

With this alternating-current rectifier a storage battery may be charged from the alternating-current lighting circuit, this feature rendering it suitable for use in small charging stations or in private garages. A solution, in a metal case, acts as a check valve to the electrical circuit, permitting current to pass in only one direction between the two elec-



P.B.B. assembly for extending Ford wheelbase to 124, 130 or 136 in., to form a 1-ton truck chassis



Gates radiator cover closed and open

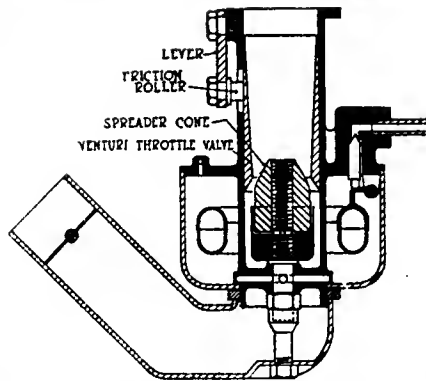
trodes suspended in the solution. An auto-transformer, mounted at the top of the case, steps the lighting voltage down to the point required for storage-battery work. One 12-volt or two 6-volt batteries may be charged at 3 amp., or one 6-volt at 5 amp. on a 110-volt, 60-cycle line. Price, No. R1000, complete, \$17.50.—Clapp-Eastham Co., 139 Main Street, Cambridge, Mass.

Storage batteries may be charged from an alternating current lighting circuit by the use of the Blitzen rectifier below.



**Weaver Universal Tire Changer**

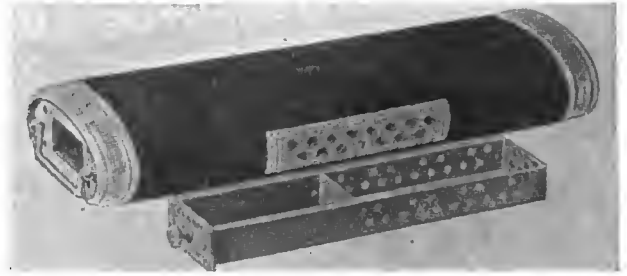
The removal and replacement of demountable rims is facilitated by this device. A heavy cast-iron base carries three adjustable arms that hold the tire and rim in a horizontal position at a height that is convenient. Straight-side or clincher tires are removed by the wedging action of a steel roller carried on a swinging arm, and are replaced by a set of rollers acting on the bead of the tire. Split rims are contracted or expanded by means of a screw-operated metal hook. Price, \$44.—Weaver Mfg. Co., Springfield, Ill.



Justrite carburetor. Note the sliding venturi-throttle valve

**Justrite Carbureter**

The Justrite is a single-adjustment carbureter in which the air is controlled by a sliding venturi. The carbureter is characterized by the absence of springs and the common butterfly throttle valve, throttling being effected by the variations in opening of the gas passage due to the movement of a hollow tapered tube sliding over a conical



The Clark steel heater is a metal chamber in which is placed fuel in the form of compressed carbon bricks. It can be used in any kind of a car

plug. It is claimed that one adjustment of the spray nozzle is all that is required, and does not have to be changed for changes in altitude and temperature. Price, 1 in., \$20; 1 1/4 in., \$25.—Wilcke-Armstrong Co., 182 Beau-bien Street, Detroit.

**Gates Radiator Cover**

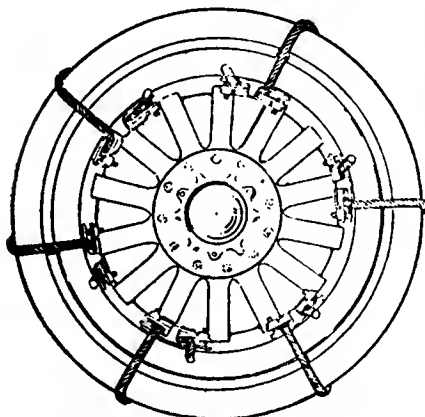
This radiator cover is made of Fabrikoid lined with heavy felt and is said to be easily attached, quickly opened and closed. Price, sample by parcel post, \$1.25. Hood cover, 90 cents extra. Radiator covers, per dozen, \$12. Hood covers, \$6 per dozen.—Gates Mfg. Co., Indianapolis.

**Harrington's Traction Producer**

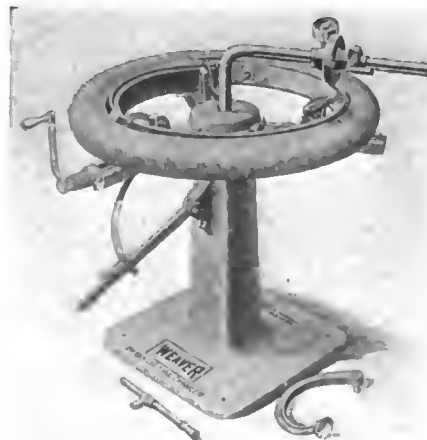
This anti-skid device is designed for motor trucks. Each wheel set consists of six units; each unit being a seven strand steel cable locked onto the tire by means of a metal clamp. It is said that the cable is longer lived than a chain and effectively prevents skidding, and, being soft and flexible, cushions the shock on contact with the road.—Standley Skid Chain Co., Boone, Iowa.

**Clark Steel Heater**

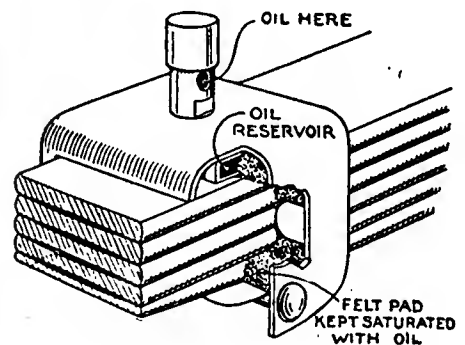
Heat is supplied by the combustion of compressed carbon bricks. These bricks are held in a riveted steel body, lined with asbestos and covered with velvet plush. The body of the heater is 24 in. long and weighs 12 lb. One brick is said to furnish a steady heat for 12 to 16 hr., and may be purchased for 75 cents per dozen.—Price, No. 8XXX, \$10.—Chicago Flexible Shaft Co., LaSalle and Ontario Streets, Chicago.



Harrington traction producer



Weaver Universal Tire Changer



Brown spring oiler showing application

# Industrial Miscellany

**Auto Body Co.,** Appleton, Wis., formed by D. H. Pierce and Gustave Seeger. Operations commenced. All types of bodies will be made for passenger cars and trucks.

**Fuller & Sons Mfg. Co.,** Kalamazoo, Mich., parts maker, will build a four-story addition, 60 by 176 ft., to cost \$150,000.

**Universal Four Cycle Motor Co.,** Muskegon Heights, Mich., has bought a site and will build a plant.

**Torbensen Axle Co.,** Cleveland, will build a machine shop addition of about 30,000 sq. ft. Contract has been awarded.

**Gray Motor Truck Co.,** Gary, Ind., is asking bids on an assembling plant, 110 by 120 ft., to cost \$9,000.

**East Palestine Rubber Co.,** East Palestine, Ohio, has prepared plans for the first unit of its new plant, 200 by 400, and a power plant, 90 by 100 ft.

**A. Z. Metal Works,** Thiensville, Wis.,

which lost its plant by fire recently, has resumed operations in a new factory. It specializes in motor truck and tractor radiators and cooling systems.

**Cleveland Motor Plow Co.,** Cleveland, which recently erected a plant for the manufacture of motor plows, has placed contracts for an additional building, 60 by 300 ft.

**Bates & Edmonds Motor Co.,** Lansing, Mich., maker of a special oil-burning engine and standard gasoline engine, is completing an addition which will double the capacity of the plant.

**Sioux City Tire & Mfg. Co.,** Sioux City, Ia., will build a plant, 80 by 130 ft., two stories, with boiler-room ell 30 by 52 ft.

**Beaver State Motor Car Co.,** Gresham, Ore., will soon complete its malleable-iron foundry.

**J. P. Gordon Co.,** Columbus, Ohio, has made a carload shipment of Ford seat

covers and tire covers for all makes of cars. It is also making two other carload stock shipments.

**Blue Ribbon Body Co.,** Bridgeport, Conn., formed to build automobile bodies. Capital is \$500,000. Incorporators are E. A. Godfrey, J. J. Godfrey and G. H. Woods.

**Smith Motor Truck Corp.,** Chicago, has broken ground for the second new plant. Building is expected to be finished by May 1. Company is planning to produce 50,000 Smith Form-A trucks during the coming year.

**Auto Specialty Co.,** St. Joseph, Mich., recently moved here from Joliet, Ill., will commence production.

**Gile Tractor Co.,** Ludington, Mich., has doubled its force and is employing more than 180 men.

**Ford Motor Co.,** Detroit, will erect a steel frame building there in addition to its present plant at a cost of \$265,432.

## The Automobile Calendar

### ASSOCIATIONS

Feb. 13-14—St. Joseph, Mo., National Annual Convention Pikes Peak Ocean to Ocean Highway Assn.

### CONTESTS 1917

April—Los Angeles to Salt Lake City Road Race.  
 May 19—New York Metropolitan Race on Sheephead Bay Speedway.  
 May 30—Indianapolis Speedway Race, Championship.  
 June 9—Chicago, Ill., Speedway Race, Championship.  
 June 23—Cincinnati, Ohio, Speedway Race.  
 July 4—Omaha, Neb., Speedway Race, Championship.  
 July 4—Tacoma, Wash., Speedway Race, Championship.  
 July 14—Des Moines, Iowa, Speedway Race, Championship.  
 Aug. 4—Kansas City Speedway Race.  
 Sept. 3—Cincinnati, Ohio, Speedway Race, Championship.  
 Sept. 15—Providence, R. I., Speedway Race, Championship.  
 Sept. 29—New York, Speedway Race, Championship.  
 Oct. 6—Kansas City Speedway Race.  
 Oct. 13—Chicago, Speedway Race.  
 Oct. 27—New York Speedway Race.

### SHOWS

Feb. 3-10—Minneapolis, Minn., Show, Minneapolis Automobile Trade Assn.  
 Feb. 5-9—Boston, 8th National Good Roads Show, Mechanics' Bldg.  
 Feb. 5-10—Indianapolis, E. W. Steinhart Bldg., Indianapolis Automobile Trade Assn.  
 Feb. 5-10—Bangor, Me., Bangor Automobile Assn., Auditorium.  
 Feb. 5-10—Indianapolis, Ind., Indianapolis Automobile Trade Assn., Steinhart Bldg.  
 Feb. 7-9—Washington, Pa., Washington Automobile Dealers' Assn., Washington Amusement Co. Rink, C. B. McAllister, Sec.

Feb. 7-10—Bay City, Mich., Automobile and Accessories, Armory, F. D. Shaver, Mgr.  
 Feb. 7-11—Kalamazoo, Mich., State Armory, Kalamazoo Automobile Dealers' Assn.  
 Feb. 8-15—First Pan-American Aeronautic Exposition, New York City; Aero Club of America, American Society of Aeronautic Engineers, Pan-American Aeronautic Federations.  
 Feb. 10-17—Harrisburg, Pa., Harrisburg Automobile Dealers' Assn., J. Clyde Myton, Mgr.  
 Feb. 10-17—Hartford, Conn., Show, State Armory, First Infantry.  
 Feb. 10-18—San Francisco, Cal., Pacific Automobile Show, G. A. Wahlgreen, Mgr.  
 Feb. 12-17—Bay City, Mich., Show, Armory.  
 Feb. 12-17—Kansas City, Mo., Second Annual Tractor Show, Union Station Plaza.  
 Feb. 12-17—Kansas City, Mo., Kansas City M. C. Dealers' Assn.  
 Feb. 12-17—Louisville, Ky., Show, First Regiment Armory, Louisville Automobile Dealers' Assn.  
 Feb. 12-17—Toledo, O., V. G. Kibby, 1017 Jefferson Ave.  
 Feb. 12-19—Indianapolis, Ind., Show, Steinhart Bldg., Indianapolis Automobile Trade Assn.  
 Feb. 13-15—Grand Forks, N. D., Auditorium, Automobile Dealers' Assn.  
 Feb. 13-17—Williamsport, Pa., Armory, John Kelly, Mgr.  
 Feb. 14-17—Peoria, Ill., Coliseum, Automobile and Accessories Dealers' Assn.  
 Feb. 15-17—Racine, Wis., Chas. A. Myers, Mgr.  
 Feb. 17-24—Albany, N. Y., Sixth Annual, State Armory, Albany Automobile Dealers' Assn.  
 Feb. 18-25—St. Louis, Mo., Show, Automobile Manufacturers' and Dealers' Assn.  
 Feb. 19-24—Springfield, Ohio, Show, Memorial Hall, Springfield Automobile Trade Assn.  
 Feb. 19—Pittsfield, Mass., Show, Armory, J. J. Callahan, Mgr.

Feb. 19-24—Portland, Me., Exposition Building.  
 Feb. 19-24—Grand Rapids, Mich., Show, Automobile Business Assn. of Grand Rapids.  
 Feb. 19-24—Duluth, Minn., Show, Duluth Auto Dealers' Assn., Armory.  
 Feb. 19-24—South Bethlehem, Pa., Show, Coliseum.  
 Feb. 19-24—Bridgeport, Conn., Show, Armory, Coast Artillery Corps.  
 Feb. 19-24—St. Louis, Overland Bldg., St. Louis, Auto Dealers' Assn.  
 Feb. 19-24—Syracuse, N. Y., Show, State Armory, Syracuse Dealers' Assn.  
 Feb. 19-24—Pittsfield, Mass., J. J. Callahan, Mgr.  
 Feb. 20-24—Salt Lake City, Utah, Inter-Mountain Automobile Show, Bonneville Pavilion, W. D. Rishel, Mgr.  
 Feb. 21-24—New London, Conn., Armory.  
 Feb. 21-24—Flint, Mich., Coliseum, Lake Side Park, E. W. Jeffers, Mgr.  
 Feb. 21-24—Trenton, N. J., Armory, Trenton Automobile Trade Assn.  
 Feb. 24-Mar. 3—Newark, N. J., Show, First Regiment Armory.  
 Feb. 24—March 3—Brooklyn, Show, 23rd Regiment Armory.  
 Feb. 24—March 3—Atlanta, Ga., Automobile Dealers' Assn., Auditorium.  
 Feb. 26—March 3—Great Falls, Mont.  
 Feb. 26—March 3—Omaha, Neb., Show, Auditorium, Omaha Automobile Show Assn.  
 Feb. 26—March 3—Utica, N. Y., Utica Automobile Dealers' Assn., State Armory.  
 Feb. 26—March 3—Wilkes-Barre, Pa., Hugh B. Andrews, Mgr.  
 Feb. 27—March 4—Atlanta, Ga., Show, Auditorium, Atlanta Auto Trades and Accessory Assn.  
 March 1, 2, 3—Urbana, Ill., Show, Automobile Trade Assn. of Champaign Co., Armory of the University of Ill.  
 March 3-10—Boston, Mass., Show, Mechanics' Bldg., Boston Automobile Dealers' Assn.

March 3-10—Washington, D. C., Middle Atlantic Motor Assn., Inc., Union Bldg.  
 March 5-10—Jamestown, N. Y., Jamestown Automobile Dealers' Assn., Armory, C. A. Hanvey, Mgr.  
 March 5-12—Birmingham Ala., Auditorium.  
 March 6-9—Fargo, N. D., A. Hanson, Mgr.  
 March 6-10—Fort Dodge, Iowa, Northern Iowa Show, New Terminal Warehouse, G. W. Tremain, Secretary.  
 March 7-10—St. Joseph, Mo., Auditorium, St. Joseph Automobile Show Assn.  
 March 12-17—Vancouver, B. C., British Columbia Automobile Assn., Horse Show Bldg.  
 March 13-16—Fargo, N. D., Armory and Auditorium.  
 March 14-17—Mason City, Ia., Armory, Mason City Automobile Dealers.  
 March 14-17—Davenport, Iowa, Show, Coliseum Bldg., Tri-City Auto. Trade.  
 March 17-21—Manitowoc, Wis., F. C. Borchardt, Jr., Mgr.  
 March 17-22—New Haven, Conn., Show, Hotel Taft.  
 March 17-24—Pittsburgh, Pa., Motor Square Garden, J. J. Bell, Mgr.  
 March 18-23—Cedar Rapids, Ia., Cedar Rapids Automobile Trades Assn.  
 March 19—Paterson, N. J., Sixth Annual, Auditorium, R. A. Mitchell, Mgr.  
 March 21—Trenton, N. J., Second Regiment Armory, J. L. Brock, Mgr.  
 March 27-31—Deadwood, S. D., Fifth Annual, Deadwood Auto Show, J. E. Nelson, Mgr.  
 March 31-Apr. 14—Atlantic City, Garden Pier, S. W. Megill, Mgr.  
 April—Calumet, Mich., Show, Coliseum, Frank Ketchell, Mgr.  
 Apr. 4-7—Stockton, Cal., Second Annual San Joaquin Auto Trades Assn., Samuel S. Cohn, Mgr.  
 Sept. 2-9—Spokane, Wash., Interstate Fair.

## TAKE OUT THAT KNOCK

**THAT knocking in your engine**, the difficulty you have negotiating hills—the poor acceleration response—lack of power—extravagant use of oil and gas—noisy motors—in fact fully 80% of your engine trouble is caused by just one thing—carbon in your cylinders. Clean them out with

### JOHNSON'S CARBON REMOVER

and your engine will run like it did the first 500 miles—quietly and full of "pep". **No matter how choked up** your motor may be Johnson's Carbon Remover penetrates and softens the carbon—then the heat from the engine burns and pulverizes it so that it blows out of the exhaust as you operate your car.

#### YOU CAN DO IT YOURSELF

Why pay from \$3.00 to \$5.00 for having the carbon burned out of your cylinders when you can easily do it yourself **without laying up your machine**, without even soiling your hands. You can apply it to the motor warm or cold and let it remain in an hour or over night, whichever is the most convenient.

#### SAVES GASOLINE

Clean cylinders reduce the consumption of gas from 12% to 20% giving you the maximum power and speed from the minimum amount of fuel. Johnson's Carbon Remover **saves you money** because the economy in fuel effected by its use more than makes up the price of the Carbon Remover.

#### SAVE YOUR BATTERIES

There is nothing that runs down your batteries like the self-starter. Free-from-carbon cylinders greatly facilitate starting. The use of Johnson's Carbon Remover every 1000 miles will keep your engine clean and sweet and always at its highest efficiency. It does not in any way injure the oil in the crank case.

#### OUR GUARANTEE

You take no chances for we guarantee Johnson's Carbon Remover without equivocation. **No matter how much you use or how you use it, Johnson's Carbon Remover cannot injure any part of your motor.** It is absolutely harmless to everything except carbon. You could soak your engine in it for days without the slightest injury. We guarantee it to be free from acids and chemicals.

**\$1.00 Special Offer \$1.00**

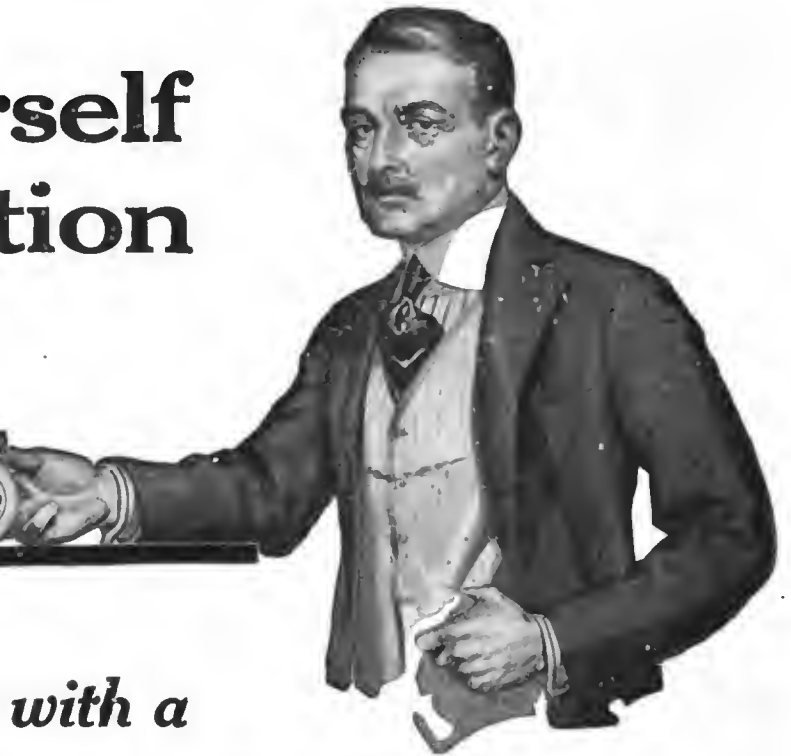
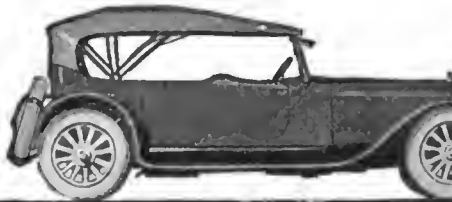
We will send you by prepaid express for \$1.00 (bill or stamps) enough of Johnson's Guaranteed Carbon Remover to thoroughly clean any ordinary four cylinder motor three times. — Please give us the name of your dealer.

**S. C. JOHNSON & SON**  
Dept. A., Racine, Wis.



Please mention The Automobile when writing to Advertisers

# Ask yourself this question



*If I replace my  
present carburetor with a*

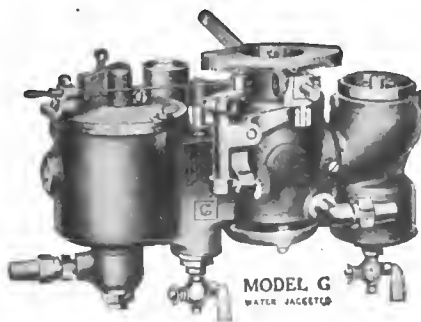
# RAYFIELD

## CARBURETOR

*How much more value will I get out of my car?*

### Here's the Answer

It will give you 20 to 50 per cent more miles per gallon—give a wide range for speed or idling with standard adjustment—give excess power for speed or hill climbing—quick pick-up, quick starting and acceleration. There are over 600 Rayfield service stations in the United States.



### Here's the Guarantee

Every Rayfield is guaranteed to render "unconditional satisfaction" to its owner. Dealers are authorized to sell it under this guarantee and to return purchase price without question within 30 days from date of purchase.

## Findeisen & Kropf Manufacturing Company

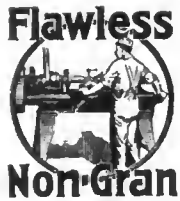
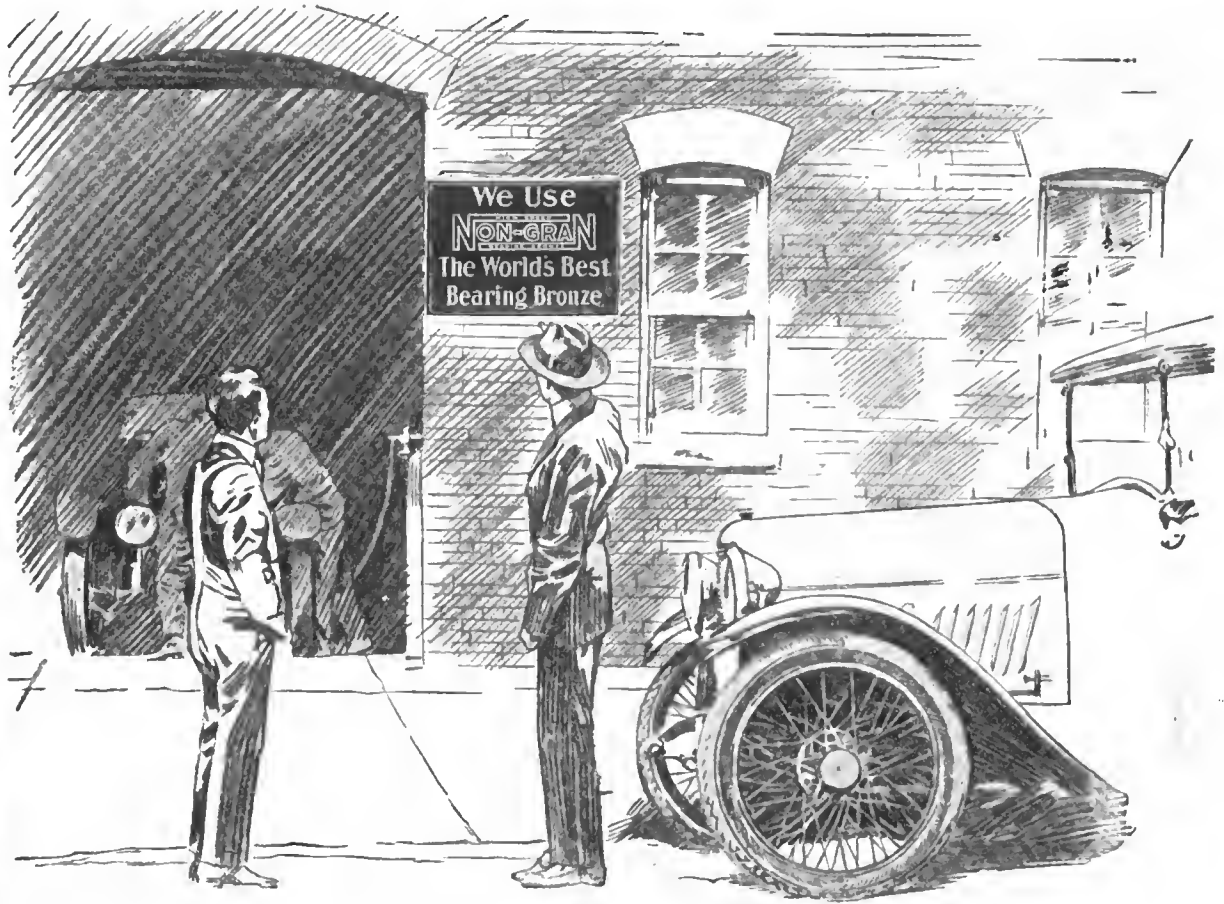
2117 Rockwell Street, Chicago

BRANCHES:

1140 Michigan Avenue, Chicago

1902 Broadway, New York

Please mention The Automobile when writing to Advertisers



**WE ARE EDUCATING YOUR CUSTOMERS**  
 —to ask for NON-GRAN replacements

This NON-GRAN Sign is of value to you.

It not only puts you in line for increased business that our extensive advertising will send to your shop, but it inspires confidence in the minds of your customers.

We have told them—which is true—that to have their worn-out bushings replaced with NON-GRAN bushings will save them money by adding to the life and value of the job you give them.

We have told them—which is also true

—that a medium priced car equipped with the finest quality bushings will stand up and deliver service practically as long as the higher priced cars.

We have told them that you would have to charge them more for NON-GRAN because it costs you more.

But that you would gladly furnish them with NON-GRAN bushings because your good work would be appreciated at its real value when backed up by this high-quality, long-wearing material.

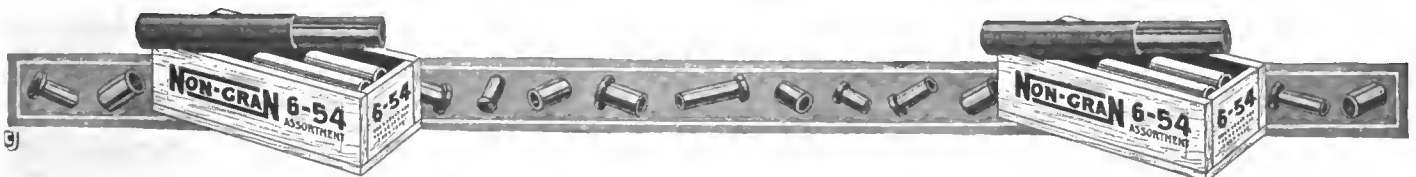
When they see this sign they will not

only be still further convinced of your reliability and high standing, but they will be ready for the increased charge and glad to pay it.

Write at once for instructive booklet, "The Backbone of Your Repair Business." This booklet will show you the way to Greater Immediate Profits and Stronger Future Business.

**American Bronze Company**  
 Berwyn . . . . . Pennsylvania

Sole Makers of Non-Gran and largest exclusive manufacturers of Bearing Bronze in the World.



Please mention The Automobile when writing to Advertisers

# Announcing a new Disc Clutch Facing



## DISC CLUTCH FACING

Patent Applied For

This is our announcement of CORTEX—a new disc clutch facing which is destined to replace old style asbestos facings on automobiles of the future.

In addition to being more durable and more resilient than facings of asbestos compositions, CORTEX offers the following important advantages:

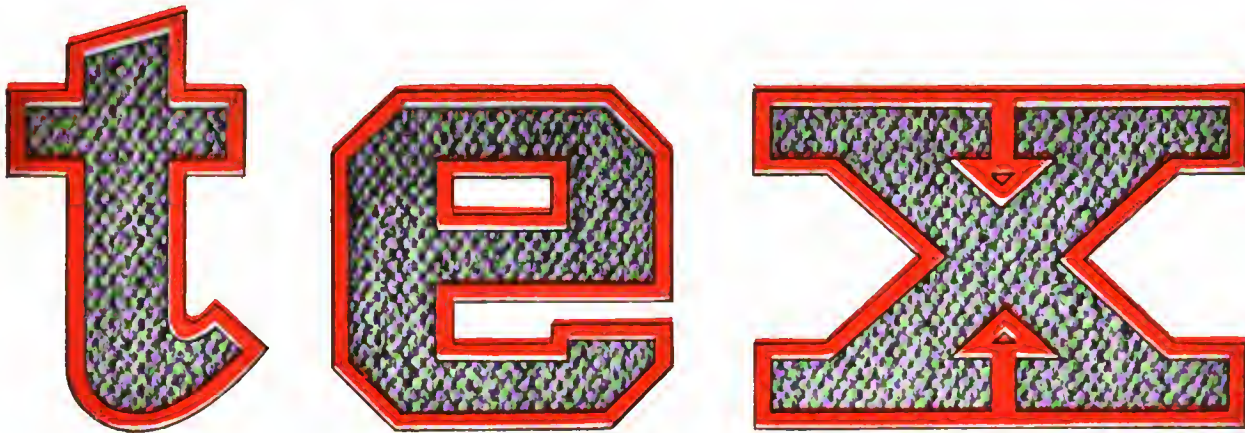
1. Requires materially less spring pressure.
2. Does not glaze over or become hard in use.
3. Presents a better co-efficient of friction.
4. Costs from one-half to one-third less.
5. *Is, and will be,* promptly available.

Asbestos, as is generally known, is now very difficult to obtain. Only limited quantities are available and these at a greatly increased cost. Here is a disc clutch facing that is *better* than facings made of asbestos compositions—a disc clutch facing that you can *get*—at from one-half to one-third less cost. A request, written on your business letterhead, ad-

# Hide Leather

227B S. MERIDIAN ST.

**Better than Asbestos Facing  
Cheaper than Asbestos Facing  
Instantly Available**



## **DISC CLUTCH FACING**

**Patent Applied For**

vising dimensions, number of discs, and type of disc (floating or riveted to plate), will bring you a sample set of Cortex facings, promptly—and without charge. Write today.

### **Read What This Engineer Says About Cortex, After Actual Tests**

This statement, from a competent engineer, is representative of the opinion of *all* who have tested Cortex:

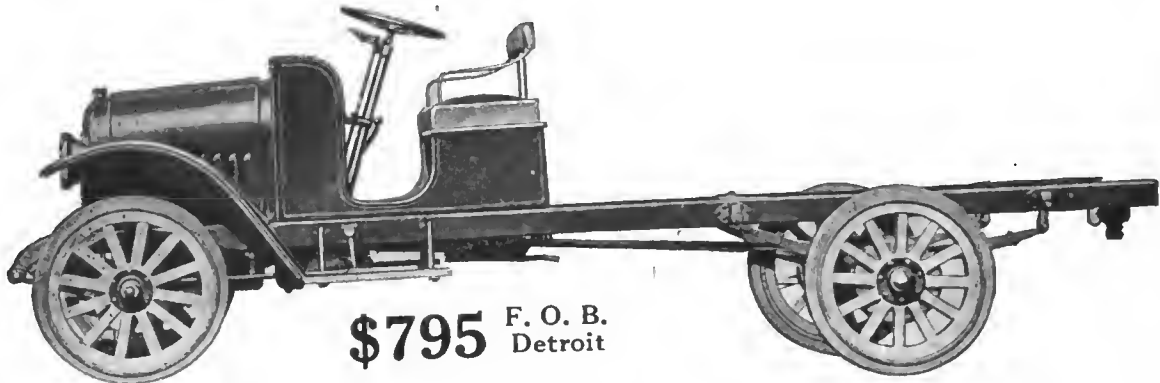
“We found, on experimenting with Cortex facings that the usually accepted engineering principles as to the frictional force in pounds to be applied per square inch need not be carried out at all. We mean by this, that our clutch with recognized asbestos facings required a spring weighing 375 pounds, while with Cortex facings we have been able to cut spring pressure down to 200 pounds. We have every reason to believe that this can still be cut down further. In fact, we intend to carry out experiments with a spring weighing 150 pounds. We believe that the cutting down of this spring pressure is simply due to the fact that Cortex facings have a great deal more cushion to them than the recognized asbestos facings and due to this cushioning effect the spring pressure per square inch can be cut down considerably.”

**& Belting Co.**  
**INDIANAPOLIS, IND.**



# Maxwell

## One-Ton Truck



**\$795** F. O. B.  
Detroit

### Arouses Unusual Interest at Chicago Auto Show

*Orders received for more than 5,000*

The new Maxwell One-Ton Truck was on display at our headquarters, Blackstone Hotel, during the week of the Chicago Show.

We knew this new Maxwell product would hold the attention of many dealers who realize the immense field for a truck of this character, size and price.

But we underestimated, not only the great number of Maxwell dealers who would visit and inspect this truck—but the scores of other dealers—and the sincere, enthusiastic interest that they all felt.

We are now, more than ever, convinced that the Maxwell Truck is going to have a nation-wide popularity that will tax even our enormous manufacturing facilities.

We expect to start deliveries in 60 days and if you were unable to attend the Chicago Show—or if you were there and could not make a satisfactory examination of the Maxwell Truck—we suggest that you get into communication with us at once.

We have printed matter giving all details of our truck. And in certain localities we can contract with the right sort of dealers.

#### Specifications

##### Standard Body Prices

Box Body with Cab and Windshield.....	\$75.00
Covered Express Body with integral cab and side curtains.....	100.00
Panel Body with integral cab.....	100.00
All prices F. O. B. Factory.	

##### Brief Description

Four-cylinder engine, cast in block, powerful and economical; three-speed transmission; gears made of heat-treated alloy steel. Worm drive, using Timken-David Brown worm and gear embodied in rear axle. Axles of heavy construction with Timken roller bearings throughout. Frame of pressed steel with heavy cross members. Extra long springs made of special spring steel. Sturdy wood wheels with steel rims. Two sets of brakes acting on rear wheels. Heat-treated alloy steels used in all vital parts, providing a margin of strength and durability adequate to insure good service and long life. Remarkable economy in fuel consumption, tire expense and maintenance cost is assured.

The regular chassis equipment includes front fenders; solid tires, 32 x 3 inches front and 32 x 4 inches rear; electric headlights and tail light; electric horn; generator and storage battery of 80-ampere-hour capacity; full set of tools. 34 x 4½-inch pneumatic tires with demountable rims on all four wheels, \$30.00 extra.

**Maxwell Motor Company, Inc.**  
Detroit, Michigan



# Very Good - but how about the upholstery - is it stuffed with **WILSON'S** (formerly Sulzbergers) **CURLED HAIR?**

Car buyers know that comfort depends upon the **quality** of the cushions. If the upholstery is hard, flat or lumpy, the car is unsatisfactory, regardless of shock-absorbers.

Do not be misled by recommendations of special metal spring construction designed to eliminate use of Curled Hair.

The upholstery is the point of contact between the passenger and the car.

**Springs respond to shocks. Wilson's Curled Hair absorbs them.**

Wilson's Curled Hair is so generally recognized that more than half of motordom rides on cushions stuffed with it.

**MANUFACTURERS—UPHOLSTERERS**

Send for a sample of Wilson's Sterilized Curled Hair. With it we will submit prices and full particulars.



Successors to Sulzberger & Sons Co.  
41st St. & Ashland Ave., Chicago



# MOHAIR VELVETS

**F**OR MOTOR CAR UPHOLSTERY "Chase" Mohair Velvet stands without an equal.

WEALTH CANNOT BUY nor factory loom produce a fabric that will surpass it in the lustrous richness of its beauty—in the enduring qualities of its wear-on-end-of-fibre weave.

MADE OF CHOICE ANGORA fleece, having a silky lustre that is ineradicable—woven in mills that have specialized in this one line for several decades—guaranteed by a 70-year-old firm of spotless reputation—"Chase" Mohair Velvet is the last word in supreme quality.

STAINLESS, FADELESS, SLOW TO SOIL, and easy to clean, it wears like iron and retains its smart, handsome appearance almost indefinitely.

NO OTHER FABRIC HAS ITS LUSTRE—no other fabric (wherein wear comes on the sides of the fibres) can be compared to it for endurance.

IN COUNTLESS DESIGNS AND COLORS, to match all makes and types of cars. Individual designs made to order.

**L. C. CHASE & CO**  
BOSTON

NEW YORK

DETROIT

CHICAGO

OTHER PRODUCTS OF OUR MILLS:  
Plush Motor Robes, Wool Robes, Steamer Runs, Wexford Motor Cloths for Tops and Slip Covers, Rubber Cloths for Tops and Side Curtains, Felt and Rubber Radiator Covers.

# CHASE



## In RAIN ~ or SHINE



# DREDNAUT

## Motor Topping

CHASE DREDNAUT MOTOR TOPPING COMBINES WITHIN ITSELF every good attribute that ingenuity has suggested and experience has proved.

IT IS A FINISHED PRODUCT MADE BY EXPERTS in this particular industry.

IT IS WATER-PROOF, EASILY CLEANED, AND EXTREMELY DURABLE. It remains whole, hardy and good looking as long as most cars last. Wetting will not rot it, and it is extremely hard to tear or scratch.

DUST WILL NOT STICK TO IT, AND MUDSPOTS ARE EASILY removed with sponge and water.

IT OUTSELLS ANY OTHER TOP MATERIAL SIMPLY ON ITS LOOKS, and actual experience has shown that those who use it once continue to use it altogether.

**OTHER PRODUCTS OF OUR MILLS:**

*Plush Motor Robes, Wool Robes, Steamer Rugs, Wexford Motor Cloths for Tops and Slip Covers, Rubber Cloths for Tops and Side Curtains, Felt and Rubber Radiator Covers.*

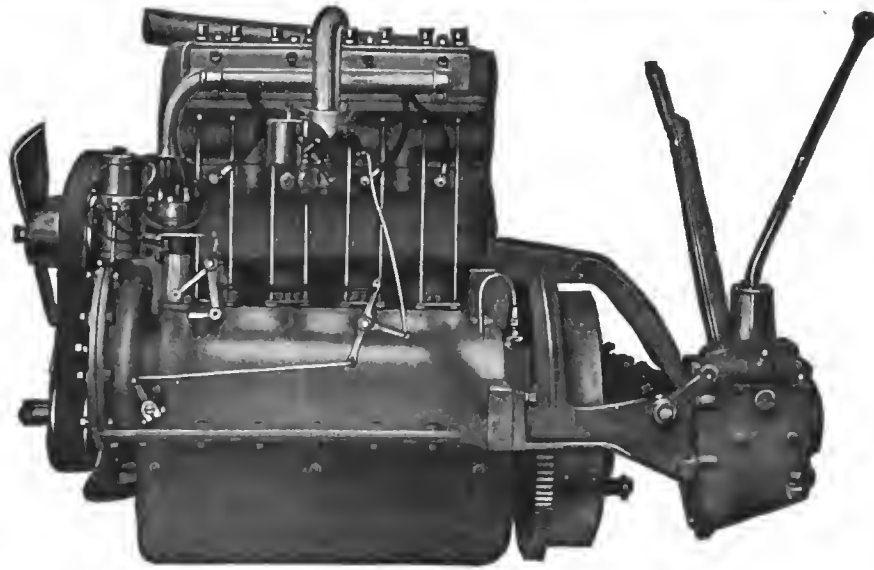
**L·C·CHASE & CO**

**BOSTON**

**NEW YORK**

**DETROIT**

**CHICAGO**



A Modern Light Weight Motor of  
Exceptional Power and Refinement

## The Monroe

The power plant of the Monroe Car is indicative of the high service value of the Monroe Car. It consists of a high-speed, four-cylinder, valve-in-head motor, with removable cast en bloc cylinder heads, 3 1-4 in. bore, 4 1-2 in. stroke, 150 in. piston displacement. The valves are large and easily adjusted. The intake manifold is integral with the cylinder head bloc. It has a pressure oiling system, the oil circulating through the crankshaft to all bearings, with a gear pump and a pressure regulator valve acting with the gasoline throttle to increase the oil pressure with the increase of power production, thereby preventing over or under cylinder lubrication.

The crankshaft is larger than those used on other cars of this size motor. The crank bearings are 2 1-4 in. The counter balances are a part of the original casting instead of being welded or bolted on as is the case with every other crankshaft today.

The power plant is of the unit type with a multiple disc clutch, using six dry plates of Raybestos and steel, and with selective sliding gear with double heat treated nickel steel gears and ball bearings.

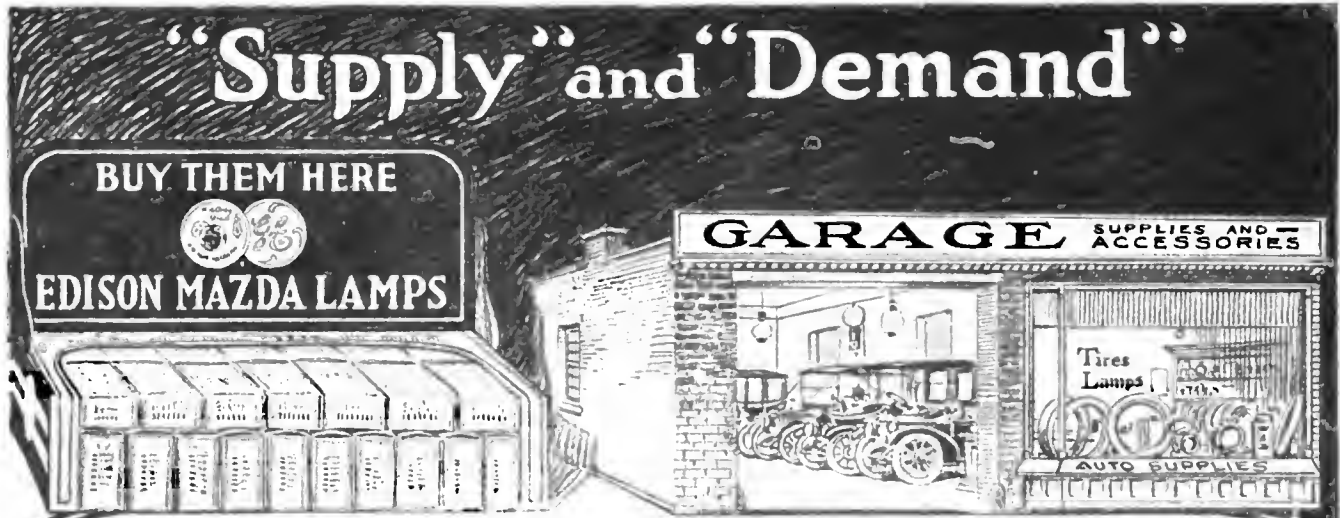
This power plant, complemented by a complete equipment of standard units, gives the Monroe Car one of the most powerful and efficient light weight engines in America, unequalled by anything now on the market at double the price.

Dealers looking for a moderate priced car which will sell on construction and actual performance, should investigate the Monroe. Send us references and let us know what you have done. If you can qualify the Monroe Motor Company will be glad to send you its terms and discounts, and give you all the support you need.

Price, \$985. f.o.b. Pontiac.

**MONROE MOTOR COMPANY**  
Pontiac, Michigan





Isn't it a nuisance, after breaking a lamp or having a burnout, not to be able to replace that particular lamp **at once**?

Why don't you make it a point to supply yourself with a spare set of

# EDISON MAZDA Automobile Lamps?

Carry them in your car, for emergencies. They come in a handy chest made for the purpose.

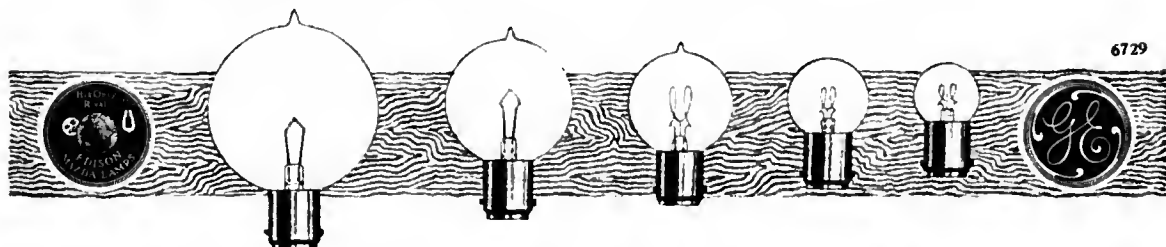
Demand Edison Mazda because the garage or accessory dealer that carries the Edison Mazda Automobile Lamp Assortment can quickly equip your car with the correct lamp for every socket. His Edison Mazda Auto Booklet will tell him exactly which lamps you need for any 1915, '16 and '17 models of any car.

Go to the garage or store that really **serves** its motorist customers. There you will find Edison Mazda Automobile Lamps. If you don't find them there you'll only have to mention it once.

## EDISON LAMP WORKS of General Electric Company

*Sales Offices in Principal Cities*

HARRISON, N. J.



Please mention The Automobile when writing to Advertisers

Note the **ADJUSTABLE** end brackets—a special feature of the J-M Speedometer, Instrument Board Type

**F**ORD models differ in width of body, and instrument boards of fixed length are applicable to one type only. The instrument board supplied with the J-M Speedometer, Model 3009, provides for width discrepancies by an ingenious adjustable end bracket (Patent Applied For). No need to measure up the car, for this board will fit it without other labor than taking nuts off two windshield and two body bolts, slipping the board on, and replacing nuts.

The combination J-M Speedometer and Instrument Board will be shipped and sold *assembled*—the board cannot be sold separately. Retail price, complete, \$11.25.

The new J-M Speedometer is made up with black dial and large clear *white* figures and pointers. Speed range, 0 to 60 miles. New 10,000-mile season odometer with exceptionally large figures.

Instrument Board is of wood, finished in soft, dull black, with J-M Speedometer flush mounted. The wooden board makes easy the application of other instruments, such as lighting and starting switches, clocks, carburetor controls, etc.

Model 3006 is our new Suspension Plate Type of Speedometer, which fastens on the windshield strip of Ford cars wherever desired. Speedometer is mounted flush in plate. Retail price, \$11 complete.

Model 3000, for bracket mounting next to spark coil box, has 60-mile speed scale and 100,000-mile season odometer movement. Finished in black enamel with brass trimmings. Retail price, \$10 complete.

Further details on application.

**H.W. JOHNS-MANVILLE CO.**  
NEW YORK CITY

*Branches in 55 Large Cities*

Other J-M Automobile Accessories include J-M NON-BURN Asbestos Brake Linings, J-M Fire Extinguishers, J-M Soot-Proof Spark Plugs, J-M Auto Fuses, and J-M Automobile Tape. Jobbers or dealers interested in handling the complete line may get information from our nearest Branch.

**JOHNS**



## An Accessory Line that Sells— and a Sales Policy that Satisfies

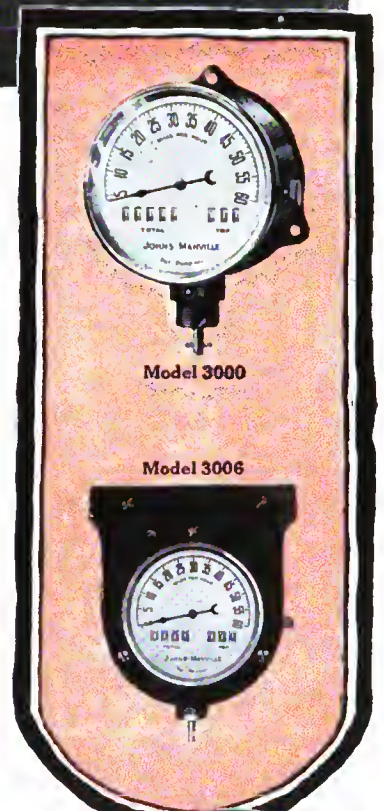
**B**EFORE you select accessories, put yourself in your customer's place. Ask if they satisfy—in design, material, finish, price—and whether the name of the company behind them inspires confidence.

Next, as a dealer, ask these questions: Will the manufacturer co-operate or compete with me? Will he sell *through* me, or just *to* me? Must I tie up capital in large stocks to secure the best discounts? Are the margins attractive? Can I get new stocks promptly? Will my customers get a square deal—and can I build up enduring relations?

Then study the Johns-Manville proposition on each of these vital points. The consumer already knows Johns-Manville—a National Institution. And every J-M Product must conform to J-M Standards—which means it will stand up in service.

The keynote of our sales program is co-operation with dealers through every channel to help move our goods. Our accessories are sold only to recognized jobbers and dealers, and discounts are generous, strictly maintained, and uniform, *regardless* of size of order. Our manufacturing facilities are ample, even for our big 1917 output—and J M Responsibility backs each J-M Product to the limit.

So our accessory business is on a bed-rock basis. The products are right, and the sales policy is both equitable and practical. It's a profitable proposition for any dealer—and if you're not already on our list, we'd like to send you details. Ask your jobber about it, too.

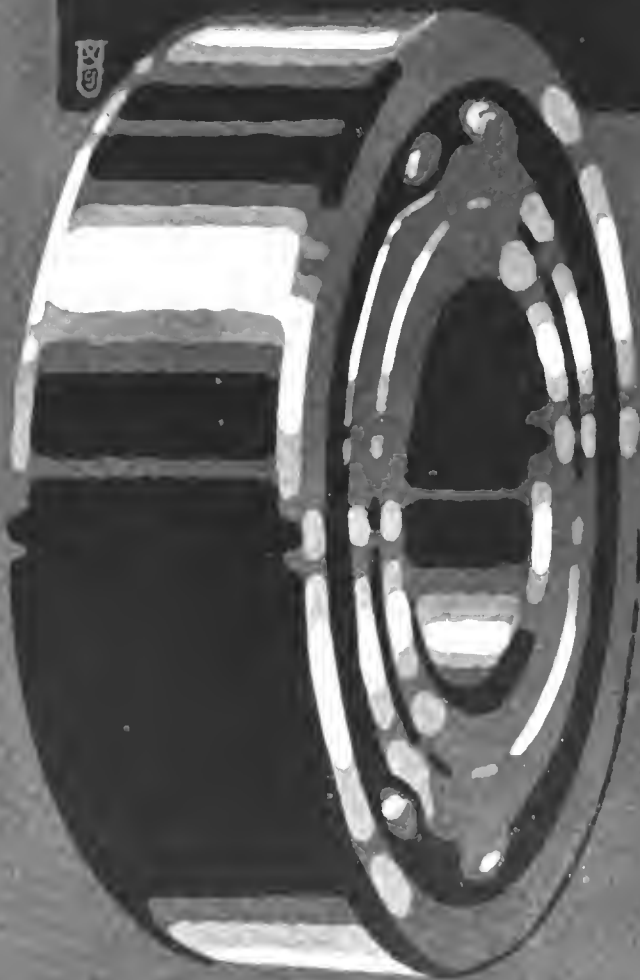


# MANVILLE

COVERS THE CONTINENT

Please mention The Automobile when writing to Advertisers





**GURNEY Ball Bearings** stand with the best in the world in the matter of actual service capacity.

They are made from the highest quality Chrome Steel, carefully prepared and thoroughly tested.

In refinement of design and development of manufacturing practice, the GURNEY is foremost not only in radial load capacity at maximum speeds, but in ability to withstand unusual thrust load.

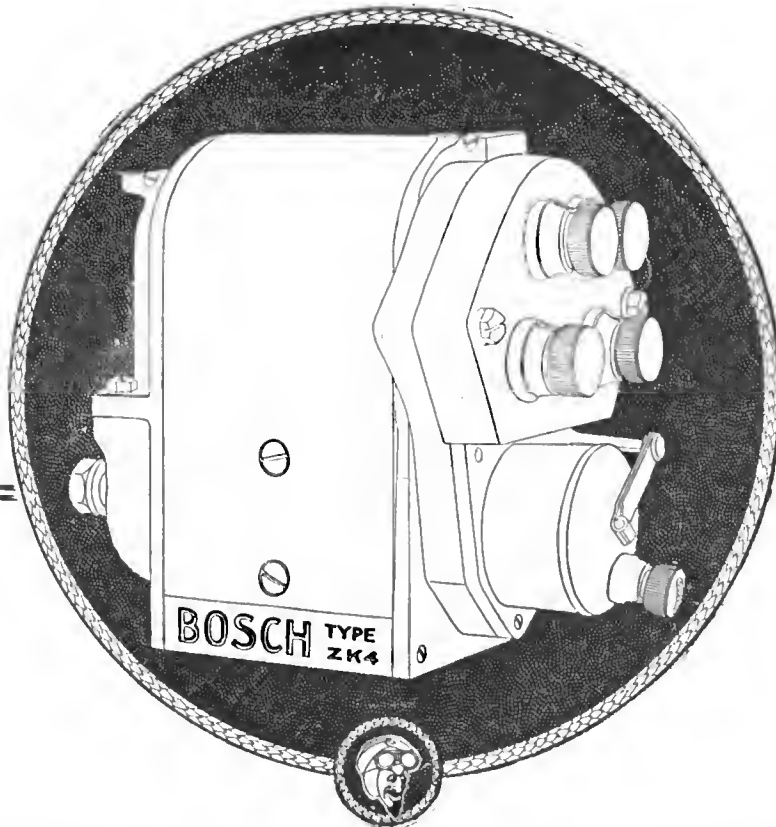
**GURNEY BALL BEARING COMPANY**

Corred Patent Licensee

**JAMESTOWN, NEW YORK**

Chicago, Ill.

New York City



## *Unflinching Sturdiness*

Does Your Ignition  
System Show It?

Unusually severe service has never caused Bosch Magneto Ignition to fail.

The freezing, penetrating, zero weather of the Northwest won't harm a Bosch Magneto.

And the baking, blistering heat under the bonnets of the thundering racing monsters, which Bosch has helped to victory, has never harmed a Bosch Magneto.

Using a car once a month or every hour of the 24 every day in the year won't harm a Bosch Magneto.

Lack of attention for a day, a week, or a month won't harm a Bosch Magneto.

A short circuit at the horn, at the lights or at the battery box won't harm a Bosch Magneto.

Bosch Magnetos don't need batteries.

And all this is why Bosch Ignition is called the system of unflinching sturdiness and nothing less than a Bosch Magneto will give you that sturdiness.

BE SATISFIED

SPECIFY BOSCH

**Bosch Magneto Company, 220 West 46th Street, New York**

CHICAGO

DETROIT

SAN FRANCISCO

Service Stations in Every State



# Unprecedented Demand for *National* **Speedway Tires**

Made in  
**POTTSTOWN, PENNA.**

has built this factory

Here in the new sunlit NATIONAL plant—we are not handicapped with obsolete facilities or old-time ideas.

Our buildings are new. Our entire equipment and machinery is new.

It is the finest and most modern money can buy. Everything is up to the minute.

Every known method of securing full maximum efficiency has been adopted.

With such modern facilities it would be possible for us to turn out many more tires each day than we do.

Yet we prefer to go slow.

We prefer to give to each "Speedway" tire the careful individual workmanship and rigorous inspection that will insure its delivering mileage well in excess of its guarantee.

As a result all "Speedway" tires consistently deliver their full quota of mileage.

Car owners are finding that they can confidently depend upon any Speedway Tire to give uninterrupted service until at least 5,000 miles has been received.

Speedway tires are made in the Non-skid only.

This is because the Speedway Non-skid is as smooth riding as a plain tread.

Yet there was never a more perfect Non-skid made. There are no knobs in the tread, no bumps nor lumps, nor depressions, to cause inside fabric strain and wear.

The contact of the tread with the road is smooth and continuous.

The tire is able to wear out naturally before the carcass "gives out" because of inside fabric wear.

Let your next tire be a "Speedway" and see for yourself that there is really such a thing as "Tire Luxury at a Moderate Price."

You will be surprised at the low cost mileage you will secure.

Speedway Tires are not as yet for sale in all cities. If your dealer cannot supply you, write direct.

## DEALERS—JOBBER

Write for full particulars regarding the new National Sales proposition, discounts, etc.

More than one big tire dealer has made more money with the National line.

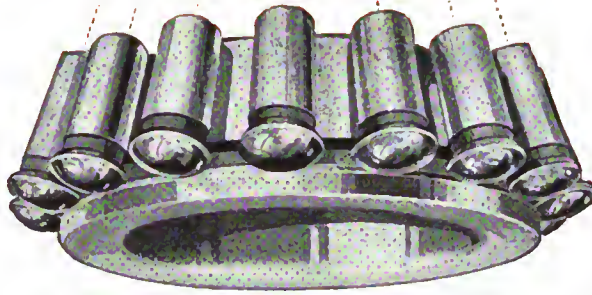
Get an idea of what we can do for you. The plan is well worth investigation.

**5000  
Miles  
Guaranteed**

**NATIONAL RUBBER COMPANY**  
POTTSTOWN PENNA.

# BOCK

Everything  
Rolls



Every load carrying contact in the Bock Bearing is a *rolling* contact.

Everything rolls.

There is no thrust or end friction—no sliding and scraping.

For the end of each Bock roller is a section of a perfect sphere—and rolls in unison with the tapered rollers.

Consequently you get the great strength of the roller bearing *plus* the best features of the ball bearing.

And this important combination, is *exclusive* in the Bock.

Automobile engineers everywhere have been quick to recognize the advantages of such a bearing. And the Bock is replacing other types in motor cars as rapidly as we can fill the orders.

The Bock Bearing Company, Toledo, Ohio



**Ball Ends**

The only roller bearing  
with frictionless rolling end contact



## MOTOR PRODUCTS CORPORATION



# FIVE BIG COMPANIES REORGANIZED AS ONE

In the Motor Products Corporation of Detroit continues the business of the Diamond Manufacturing Company, the Rands Manufacturing Company, the Vanguard Manufacturing Company, the Superior Manufacturing Company and the Universal Metal Company—all formerly well and favorably known concerns in their respective lines.

We believe the Motor Products Corporation stands as a particularly unique organization in the history of automobile building, for at no time before has a number of healthy and growing parts concerns reorganized into one big active manufacturing company. Furthermore, we believe the Motor Products Corporation is an organization of great importance to automobile and truck manufacturers, because of the increased economies of production and the betterment of service to customers effected through conducting manufacturing operations in one large unit, under one centralized management.

The Motor Products Corporation is continuing to manufacture the same high quality products formerly marketed by the constituent companies—hub caps, radiator parts, wind-shields, tubing and other accessories—in its huge new Detroit factory. Branch factories are located at Ann Arbor, Mich., and Walkerville, Ont.

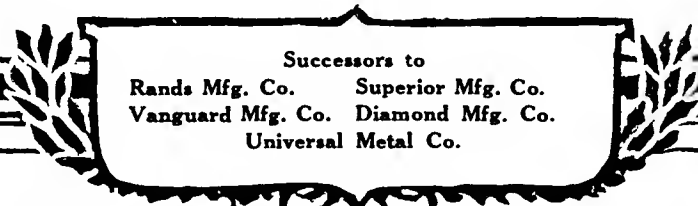
## MOTOR PRODUCTS CORPORATION

DETROIT, MICHIGAN

W. C. Rands  
President  
H. H. Seeley  
Vice-Pres. and  
Director of Sales

D. B. Lee  
Treasurer and Gen'l Mgr.  
C. F. Jensen  
Vice-Pres. and  
Director of Purchases

R. R. Seeley  
Production Manager  
M. L. Brown  
Secretary

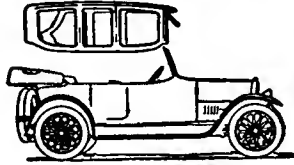


Successors to  
Rands Mfg. Co. Superior Mfg. Co.  
Vanguard Mfg. Co. Diamond Mfg. Co.  
Universal Metal Co.

Please mention The Automobile when writing to Advertisers

# KISSELKAR *The* ALL-YEAR Car

*Kissel's Original Idea That  
Changed the Motoring  
Habits of a Nation*



## *The Hundred Point Six*

The car of a Hundred Quality Features that possesses that faultless made-to-your-order style, that exclusive appearance which prosperous motorists demand in their motor cars.

*Price F. O. B. Factory*

Touring-Sedan . . . . .	\$1635
Roadster-Coupe . . . . .	1635
Victoria-Town Car . . . . .	1950
HUNDRED POINT SIX Standard Touring . . . . .	1195
HUNDRED POINT SIX Gibraltar Body . . . . .	1285
DeLuxe 6-42, 7-Passenger	1750
DeLuxe 6-42, 7-Passenger Sedan . . . . .	2100

OWNERS quickly acknowledge that the height of *mechanical perfection* and *body construction* is reached in its driving simplicity, ease of control, riding comforts, exclusive lines and individual characteristics.

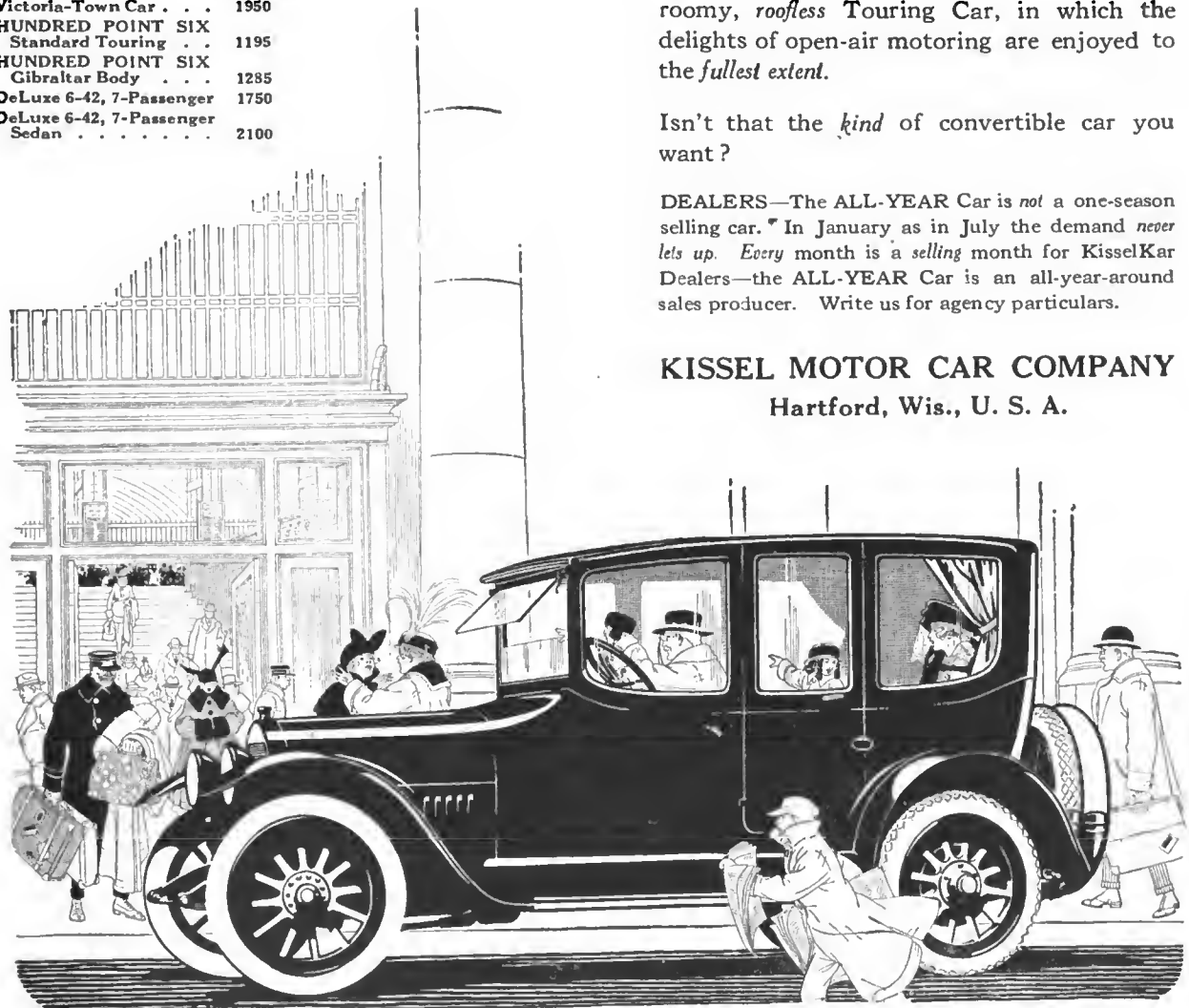
The mighty Kissel-built engine meets any demand for *flexibility* in traffic zones, *speed* on the straightaway or *power* on the incline.

The ALL-YEAR Top is *built in*—not on—it is found on no other car but a KisselKar. It is *not* an ordinary convertible car—*not* a permanently roofed car. The top is *entirely removable*, giving you in the Spring a wide-open, roomy, *roofless* Touring Car, in which the delights of open-air motoring are enjoyed to the *fullest extent*.

Isn't that the *kind* of convertible car you want?

DEALERS—The ALL-YEAR Car is *not* a one-season selling car. In January as in July the demand *never lets up*. Every month is a *selling* month for KisselKar Dealers—the ALL-YEAR Car is an all-year-around sales producer. Write us for agency particulars.

KISSEL MOTOR CAR COMPANY  
Hartford, Wis., U. S. A.



Please mention The Automobile when writing to Advertisers



## A Fast, Lively, Quality Tire That Is Also Puncture Proof

We guarantee the Woodworth Trouble-Proof Tire to run 5,000 miles without puncture or blow-out.

But that is only an *added* reason for buying it.

Entirely aside from its puncture proof qualities, it is one of the most reliable and durable tires ever put out.

# WOODWORTH TROUBLE-PROOF // TIRES //

The addition of a specially prepared and perfect fitting strip of chrome leather to the inner side, *after* the tire is made, makes it puncture-proof.

The springy resilience, the light, swift, lively qualities of the Woodworth are noticeable. Its wearing qualities are unequalled.

Dealers sell Woodworth Tires in quantities regardless of what other tires they handle. There is no other tire that will exactly suit the man who is looking for Woodworth performance.

## WOODWORTH TROUBLE-PROOF TUBES

—are finest red rubber, antimony-cured, hand-made, at a fair price. They enable your casings to stand up and deliver their full strength.

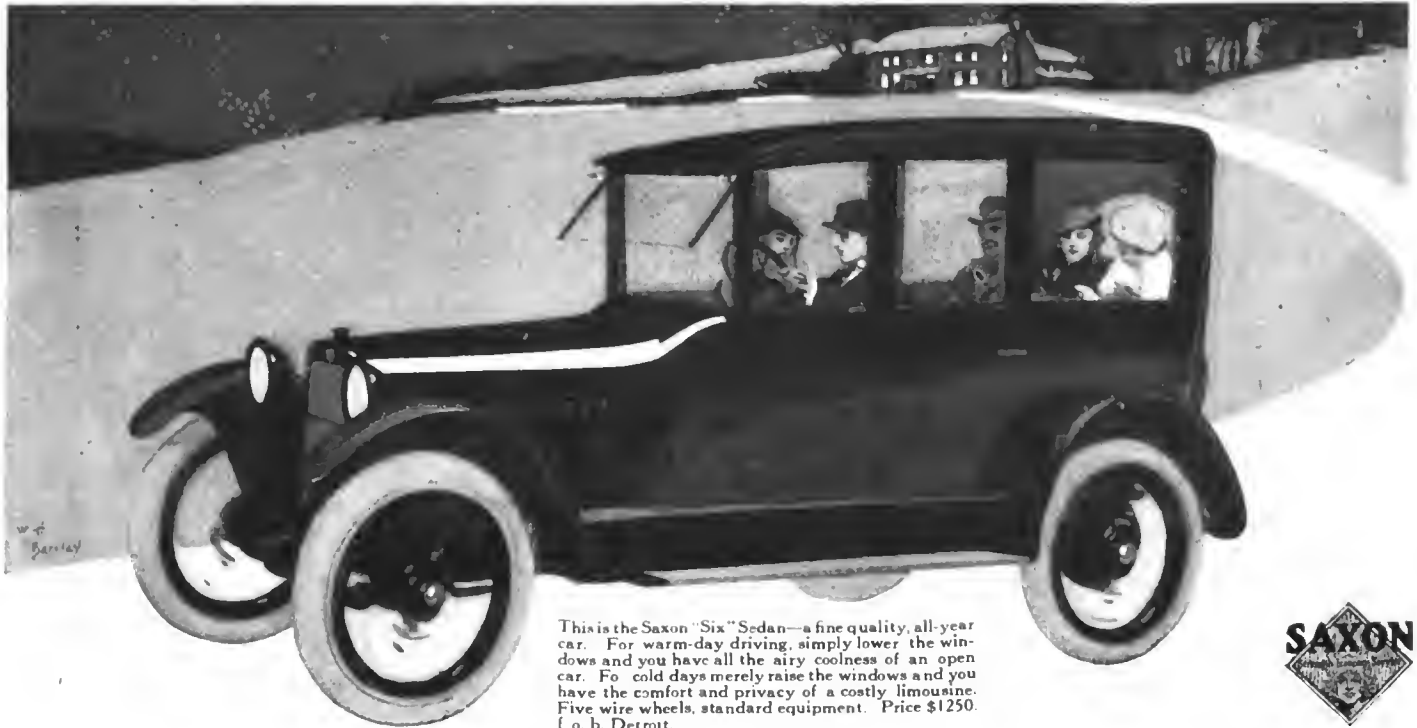
We want dealers who are building for the future and who realize that selling a tire that delivers the goods is the tire that means real business for the dealer. Exclusive territory on this remarkable tire and real co-operation is awaiting the dealers we close with.

### WOODWORTH MANUFACTURING CORPORATION

Niagara Falls, New York  
Canadian Factory, Niagara Falls, Ont.



Please mention The Automobile when writing to Advertisers.



This is the Saxon "Six" Sedan—a fine quality, all-year car. For warm-day driving, simply lower the windows and you have all the airy coolness of an open car. For cold days merely raise the windows and you have the comfort and privacy of a costly limousine. Five wire wheels, standard equipment. Price \$1250. f. o. b. Detroit.



## There Is a Strong Public Belief In the Superiority of Saxon "Six"

At last it has dawned upon motor car buyers in general that, strictly speaking, there is no rivalry between a car of less than six cylinders and Saxon "Six."

With less than six cylinders propelling the car there are bound to be slight intervals between explosions.

With six cylinders, as in Saxon "Six," these intervals between impulses are eliminated and the power-stream produced is of practically perfect continuity.

Necessarily, then, in the "less than six" with fewer impulses at any given time the force of each impulse must be more severe upon all moving parts.

In Saxon "Six," for instance, as compared with one of the best known "less than six-cylinder" cars of like price, there is nearly 98% more impulses per minute at 20 miles per hour.

So naturally each impulse at any given time is far less severe upon moving parts.

Another disappointing feature of this "less than six" is the fact that there is considerable vibration. This is caused by the intervals between impulses spoken of before.

And this vibration causes friction, which is the greatest enemy of the motor. It spells greatly shortened efficiency, and far higher repair and replacement costs.

And it means impaired performance in every phase of motor car work.

A gradual awakening to these disadvantages of the "less

than six" has incited buyers to a more careful investigation before purchasing.

And investigation has usually terminated in the same clear-cut conclusion—that Saxon "Six" is unmatched by any less-than-six-cylinder motor of like price.

So that public preference has swung strongly toward Saxon "Six" as the best car at less than \$1200.

Saxon "Six," of course, has other very material advantages.

For one, it accelerates with unusual rapidity, going from standing start to 45

miles per hour in 23 seconds. That is 22% faster than the time of the best "less-than-six" we know of.

And another is the tremendous speed and power of Saxon "Six." There is a greater amount than you are ever likely to require. It is there so that no set of road conditions can ever balk you.

Lastly, there is the economy of Saxon "Six" in the matter of repairs, and gasoline, too. 206 stock model Saxon "Sixes" in a 300-mile non-stop run established an average of 23.5 miles per gallon of gasoline.

Saxon "Six" is \$865; "Six" Sedan, \$1250; "Four" Roadster, \$495. Canadian prices: "Six" Touring Car, \$1175; "Six" Sedan, \$1675; "Four" Roadster, \$665. Price of special export models: "Six, \$915; "Four," \$495. All prices are f.o.b. Detroit.

# SAXON "SIX"

A BIG TOURING CAR FOR FIVE PEOPLE

SAXON MOTOR CAR CORPORATION, DETROIT

Please mention The Automobile when writing to Advertisers



Always on "High"  
In the Mountains or on the Avenue

# STANDARD

The Magneto

Equipped "Eight"

Brute force and Beau Brummel blent into one—with distinction in every inch of its fleet wedge of a body.

That, plus perfect obedience, so that a woman drives with ease.

This powerful magneto-equipped Standard "8" is ready always for sharp grades and rough going. Trials that grind less rugged cars into sub-

mission are a frolic for this impetuous, eight-lunged, ruly beast of a car.

You will be keenly grateful for this strong car's frame and springs, where steel-making at its level best guarantees your security and your comfort.

You'll find its rugged 127 inches of wheel-base superior to all emergencies of strain and stress.

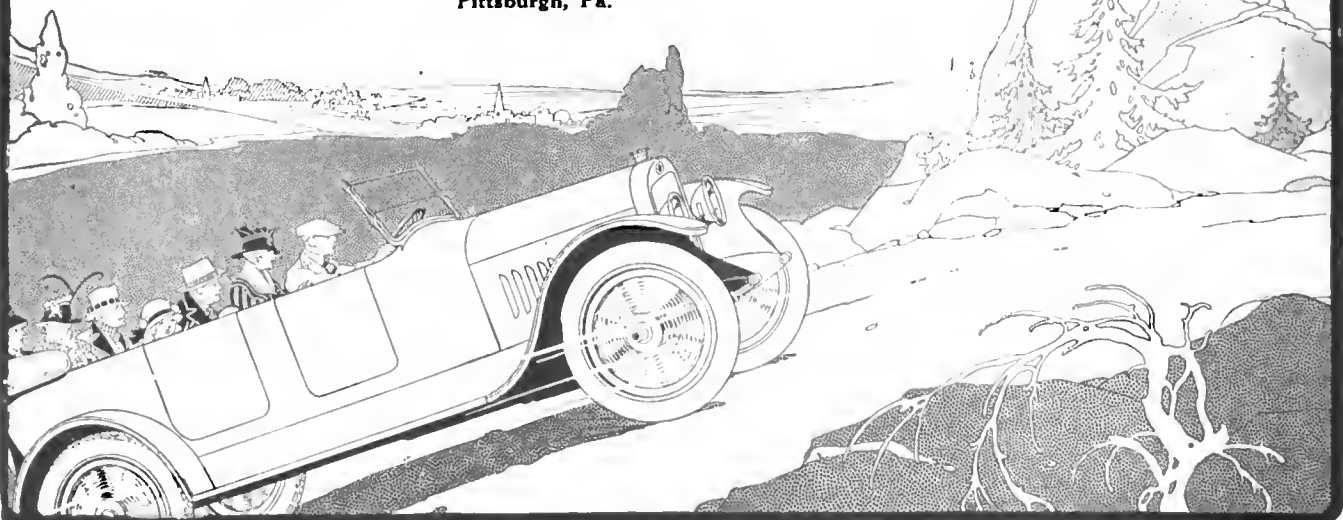
*Cabinet-size photographs, full specifications, and details of our new sales plan will be furnished upon request. Applications for unoccupied territory will receive prompt attention.*

80 H.P.—127 inch wheel-base—optional upholstery and color

Springfield Sedan	\$2500	7-Passenger Touring	\$2000
Limousine	\$3500	4-Passenger Roadster	\$1950

F. O. B. Butler, Pa.

STANDARD STEEL CAR COMPANY  
Pittsburgh, Pa.



Please mention The Automobile when writing to Advertisers



# POVASCO

STEERING

# WHEELS

## An Urgent Need Simply Satisfied

A cramped driver's seat spoils the trip for the man who owns the car.

Wriggling in and wriggling out under the steering wheel will make any man wonder why he ever bought a car. If he wonders often enough he becomes an immediate prospect for a POVASCO Steering Wheel, for incorporated in this wheel is the simplest, surest and cleverest tilting device that has ever been applied to a motor car. A pull of the knob and the wheel can be tilted forward or back in a plane absolutely parallel with the steering column, thereby giving easy entrance and easy exit to any driver, no matter how generous nature has been to him in the matter of a waist line.

This tilting feature, supreme in its field, combined with the moulded composition of all POVASCO wheels, makes this accessory not a luxury, but a satisfying necessity that car owners have long been looking for.

Another POVASCO model has the warm hand feature instead of the tilting device, and the POVASCO De Luxe (Model H) combines

both the hand-heating and tilting features with the POVASCO construction in a way that makes a marvelous appeal to the comfort-loving motorist.

Every car owner who has had to squeegee himself past the steering wheel to get into the driver's seat; every car owner whose numbed fingers have robbed him of the pleasures of motoring for seven months of the year, and every car owner whose sense of the useful and the beautiful has been disturbed by the marring of the finish on his steering wheel—in fact, every car owner who wants the right thing in the way of a steering wheel should immediately find out how POVASCO wheels can help him.

Our beautiful booklet explains and illustrates in detail. Write for it at once. We will gladly send it to you.

Distributors of automobile trade experience and the willingness to put their energy behind the sale of these wheels are wanted in every territory. The profits are generous—the prospects innumerable.

*Write now and ask us about it.*

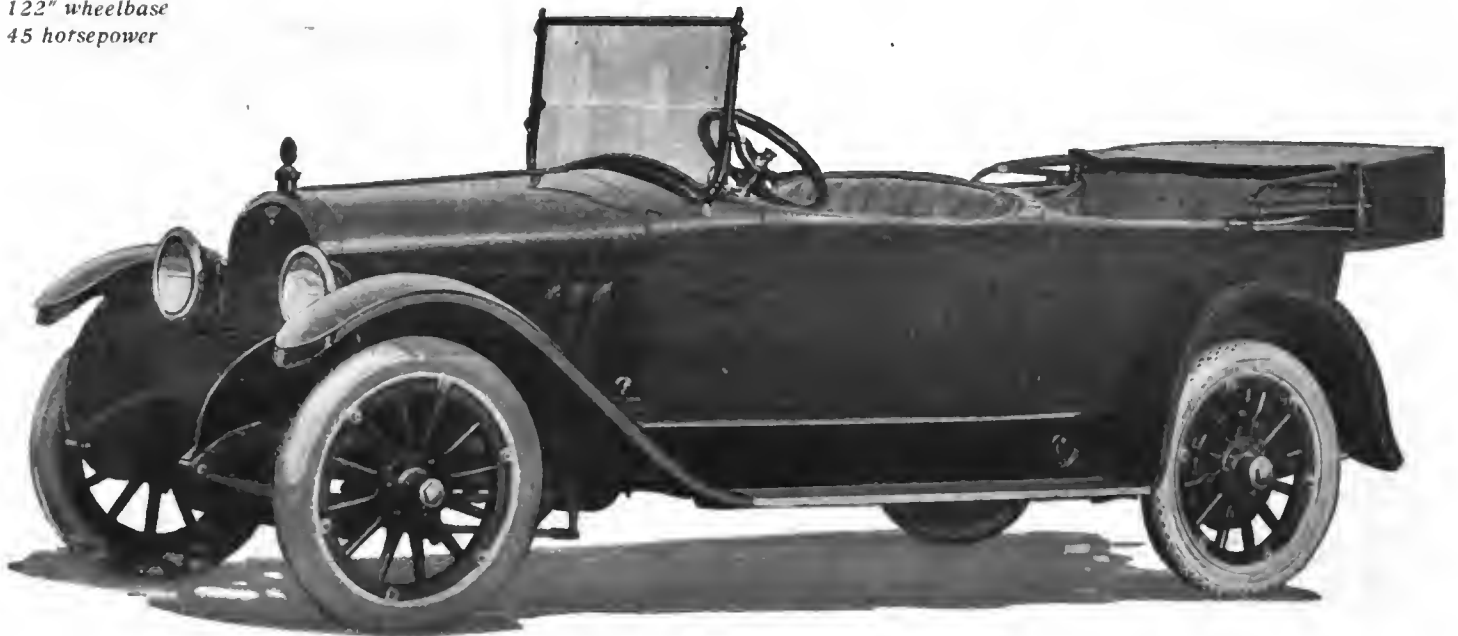
### POUVAILSMITH CORPORATION

POUGHKEEPSIE

NEW YORK

Please mention *The Automobile* when writing to Advertisers

122" wheelbase  
45 horsepower



## East and West Agree

—that in the *AMERICAN SIX* Louis Chevrolet and his associates have produced a car that is distinctly uncommon and complete.

At the New York and Chicago Automobile Shows the public and the trade alike endorsed the obvious sensible-ness of the *AMERICAN SIX*. They have labelled it a successful car.

Not a car merely *different*—but differently good.

A *Big* car that is comfortable but with low gasolene consumption and small tire expense.

A car of good judgment—sized right, tired right, powered right and priced right.

A car that has the sum total of things desirable in a motor vehicle—*Roadability*

*You will hear much of the Roadability of the AMERICAN SIX in the months to come.*

### *And in the Meantime*

The opportunity to secure the agency-representation of the *AMERICAN SIX* is still open to a Limited Number of automobile merchants. Only 3,000 of these cars will be built this season and we will take on no more agents than we can serve whole-heartedly and in a way satisfactory from every angle. You may have your share of the total provided you act promptly. Applications for territory are being considered in the order of their receipt.

Deliveries of the *AMERICAN SIX* are now proceeding in quantities and therefore dealers who contract for cars may count upon receiving their full quota. No contracts beyond our capacity to deliver will be entered into.

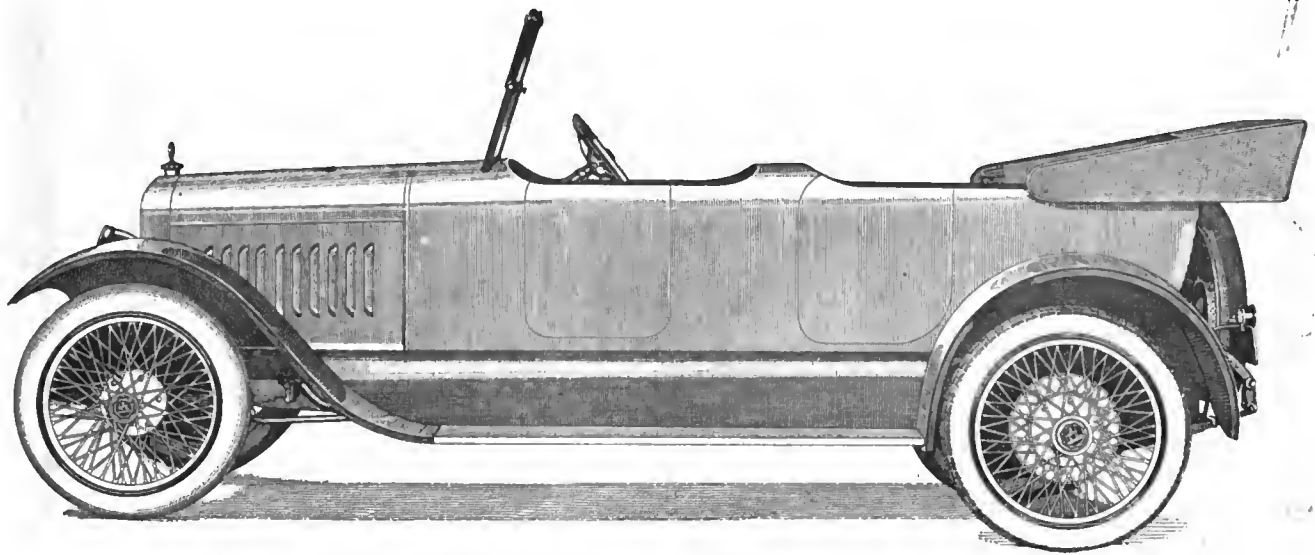
AMERICAN MOTORS CORPORATION

Plainfield, New Jersey, and New York


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# AMERICAN SIX \$1285

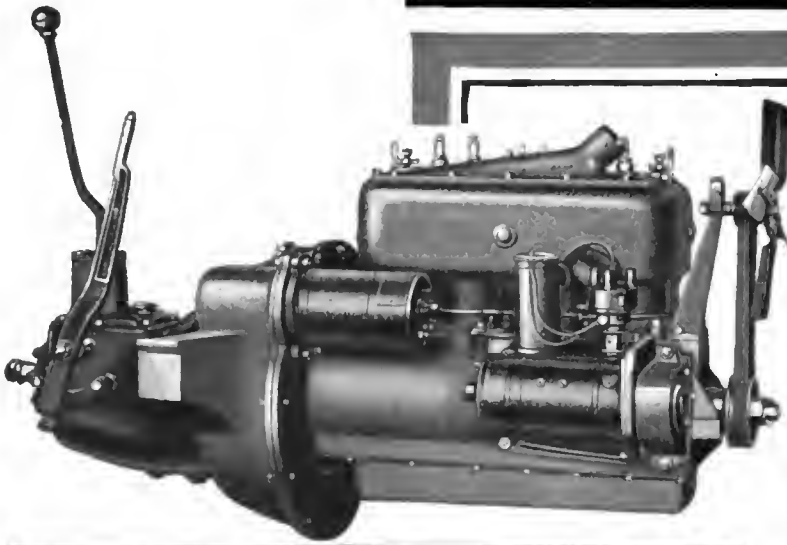
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# The Hal-Twelve

 The action of the Hal-Twelve motor is so smooth that the speed of the car is deceptive. With the speedometer covered, a speed of 20 miles per hour seems 10 miles per hour; and a speed of 60 miles an hour seems scarcely more than 30. The motor is the wonderfully smooth V-type twelve with the powerful valve-in-head construction. Hal Motor Car Company, Cleveland, Ohio

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Four Cylinders,  $3\frac{1}{4} \times 4\frac{1}{4}$  (22½ H.P., A.L.A.N.) 36.9 H.P. at 2800 r.p.m. Three bearings. All G. B. & S. Motors now provide for two-unit starting and lighting system only—operating through Bendix Drive.

## CONCENTRATION

—a bond to

## QUALITY

The minute an engineer takes the time to investigate a G. B. & S. Motor and give it a real test, under trying conditions, that instant we begin to make a convert to the G. B. & S. idea.

And by the same token, the buyer who drives a "G. B. & S." Motor instantly appreciates the various distinctive advantages that result from concentration on one model.

He finds that though this motor is rated at 22½ H.P., it develops 36.9 horse-power.

Thus he has a flexibility of operation and range of speed at his command unique in four-cylinder motor.

He is impressed by the rugged design and the marked simplicity. He is pleased with the economy. He likes the accessibility of every part. He likes the easy method of adjusting the chains, insuring silence.

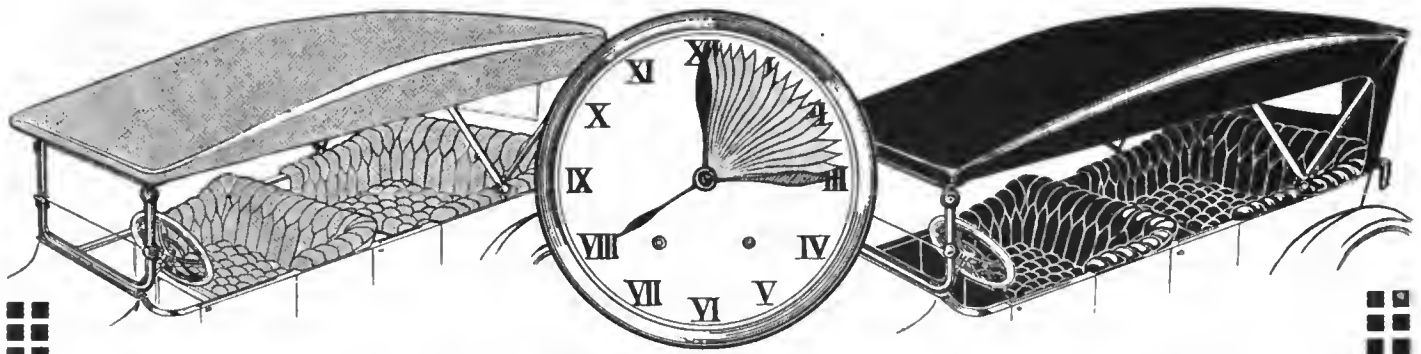
And he is delighted with the snap, verve and **powerfulness** of what he enthusiastically acknowledges is one of the best four-cylinder motors ever built.

By concentrating all our energies on this one type of motor, we virtually bind ourselves to produce a superior article—there is no other alternative. We accept the situation as it is and we leave it to "G. B. & S." users (increasing every season) to say whether or not we are delivering the goods.

*For blue-prints and other information, write*

**GOLDEN, BELKNAP &  
SWARTZ COMPANY**  
DETROIT, MICHIGAN

# G·B·&·S motors



ONLY 15 MINUTES TO DRY!



Apply LEATH-R-NU to your dingy top and cushions with an ordinary brush. Lay the brush aside at 8 o'clock. At 8:15 take a spin in your old car made new—top and upholstery a rich, lustrous black, as bright and fresh-looking as they were originally.

Not a day wasted. Not even an hour. Just 15 minutes after its application, LEATH-R-NU is dry.

LEATH-R-NU spells 1917 to 1916 car owners. It freshens, beautifies and pre-Your dealer has LEATH-R-NU in five sizes—one-half pint to one gallon. Get a can from him today.

Use WATERPROOF MOHAIR TOP DRESSINGS for leaky Mohair tops. It dyes black while waterproofing. At your dealer's.

serves Leather, Mohair, Pantasote and all other leather imitations. Keeps them soft and pliable. Oil, gasoline or water have no effect on LEATH-R-NU.

It never gets soft or sticky in warm weather. Will not crack or peel.

LEATH-R-NU is also fine for refinishing tire coverings, auto trunks, traveling bags; for making brass lamps black, and covering up scratches in the enamel on your car. Use it on anything leather, imitation leather, mohair or metal.

LEATH-R-NU

NU-BACK MFG. CO.

Dept. D, 114 No. Commercial St., St. Louis, Missouri



Come to Detroit The Automobile Center and

With the New Building and Thousands of Dollars Worth of New Equipment, Our's is the Largest, Exclusive Auto School in the Country

LEARN THE AUTOMOBILE BUSINESS - EARN \$75. TO \$300. A MONTH

Get Better Job—Or—Go In Business

We teach you to handle any auto proposition. Students actually build cars from start to finish, getting factory training in assembling, block-testing, road testing, everything. Special complete course in Oxy-Acetylene brazing, welding and cutting, separate from regular course. All leading types of starting, lighting and ignition systems in operation. Six-cylinder Lozier, eight-cylinder King used for road instruction. We have a new

Chalmers "6-30" chassis with 3490 r.p.m. motor, also Willys-Knight 1917 chassis, Maxwell 1917 chassis, Saxon 1917 chassis, Studebaker "G" 1917 chassis, Hudson Super Six 1917 chassis, Oldsmobile "8" 1917 chassis, Cole "8" 1917 chassis, Briscoe 1917 chassis, Detroit Electric 1917 chassis and Winton "6" chassis. We have Delco System, used in Buick, Hudson and Packard Twin-6.

Detroit is the Place to Learn—Start Any Time

There are 44 auto factories in Detroit and 140 accessory and parts factories. We operate Westinghouse, Autolite, Bijur Service Stations. This has added thousands of dollars' worth of equipment and makes our electrical department unequalled. Students get actual experience in handling all kinds of electrical auto equipment. We have just installed a Sprague Electric Dynamometer for block-testing purposes for students' use. The Michigan

State Auto School is the only Auto School having this equipment. Auto factories need Dynamometer men constantly. School open all the year. You graduate in from 10 to 12 weeks. Enter classes any time, any day. Three classes daily: morning, afternoon, evening. There is a great demand for Michigan State Auto School students. Auto factories call for men constantly to fill permanent places.

Follow the Crowd to the Michigan State Auto School. This is One of the 1916 Classes. Come to Detroit.

Money Back Guarantee

We guarantee to qualify you in a short time for a position as chauffeur, repair man, tester, demonstrator, garage man or automobile dealer, paying from \$75 to \$300 monthly, or refund your money. We have constantly more requests for Michigan State Auto School Graduates than we can supply.



Auto Factory Co-operation—Additional Building and Equipment

We have arrangements with the Auto factories to put them in touch with men who intend going into business for themselves. Come here and start right. Thousands of dollars' worth of new equipment, plenty of room for students to work in our new building at 687-89-91 Woodward Avenue. Our school has grown by leaps and bounds, students come from all over the world.

Auto Factories Endorse Our School

The Leading Auto Factories in Detroit, as well as in other cities, endorse our school. They put their latest complete chassis and motors in our school and employ our graduates in the factories and service stations. They know our school is right.

Get full particulars, "Auto School News" and New Catalog, both absolutely free, or better still, jump on a train, as hundreds have done, and come to Detroit, the "Heart of the Automobile Industry," and learn right.



DEALERS' OPPORTUNITY

We can supply competent high grade men to handle your garage and repair shop. Our Graduates are especially well fitted to handle electric troubles. They get actual experience while in their final work. We are constantly supplying men to all parts of the country.

ACT QUICKLY—NOW—DON'T WAIT

Michigan State Auto School

7802 Auto Bldg., 687-89-91 Woodward Ave., 11-19 Selden Ave.

The Old Reliable School A. G. ZELLER, President DETROIT, MICHIGAN, U. S. A

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# Economy of Current Consumption Positive Unfailing Action—

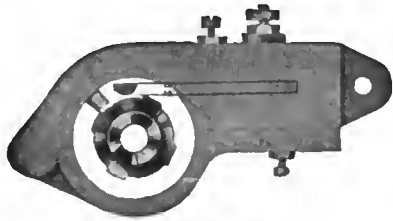


Fig. 1

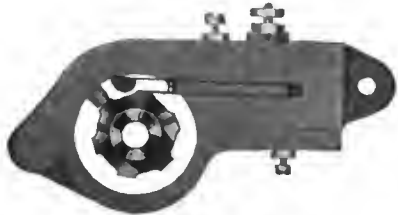


Fig. 2

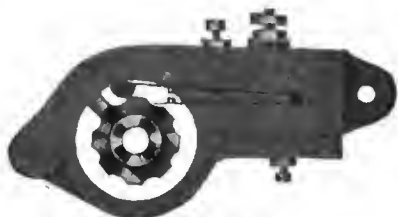


Fig. 3

—are the two points of superiority most obvious in the

## PITTSFIELD DISTRIBUTOR

An open circuit and a breaker mechanism independent of springs.

Look at these three illustrations. The two small platinum points are forced together and then forced apart by the revolving cam. The cam is so shaped that while the "make" or contact is firm it is of much shorter duration than the "break" action, thus leaving an open circuit most of the time. This means **ECONOMY**.

Notice particularly that the cam action not only drops the lower contact point, but pushes up the upper contact point, to break the contact; also that it lifts the lower and drops the upper to make contact. This means **POSITIVE, UNFAILING ACTION — MECHANICAL ACTION**.

The cam action in Fig. 1 is designed for a 4-cylinder engine; the cam action in Fig. 2 is designed for a 6-cylinder engine; the cam action in Fig. 3 for an 8-cylinder engine. Count the cams!

Electrical and mechanical lags are practically eliminated by this simple, positive action, and timing synchronization made as nearly perfect as is humanly attainable.

The whole ignition outfit is simple, compact, and made into a single unit, including the coil.



WRITE FOR COMPLETE DETAILS

**PITTSFIELD SPARK COIL COMPANY**  
PITTSFIELD MASSACHUSETTS

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Front View

Showing Spring Nut Lock applied loose on bolt before being set in place to hold until taken off

## Why Not Be Sure

that every part of the engine, chassis, or body of the car you make will stay together until taken apart?

# Spring Nut Locks

are the simplest, surest, safest device to positively lock any nut on any bolt. Resists all vibrations. Cannot harm threads. Easily applied. Released whenever desired.

## Cheapest and Best

Manufacturers, Jobbers, Garage Men, Repair Men and all Dealers should write for prices on sizes now available. Orders filled in rotation. All sizes by January 1st.

**Spring Nut Lock Co.**  
648 Transportation Building  
Chicago

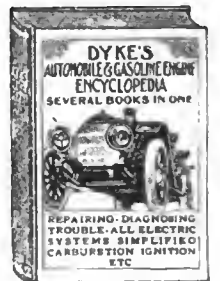


Rear View

ONE HUNDRED THOUSAND PURCHASERS OF DYKE'S BOOKS SAY IT IS THE MOST COMPLETE, PRACTICAL, SIMPLIFIED BOOK PUBLISHED

—for seventeen years Mr. Dyke has been publishing automobile books; he published the first practical one in America.

—for twenty years he has been connected with the Auto Industry, having originated the first Auto supply business and manufactured the first constant level type carburetor in America.



## DYKE'S Automobile and Gasoline Engine Encyclopedia

REVISED AND ENLARGED  
FOURTH EDITION  
(SIMPLIFIED)

**FORD INSTRUCTION**—over 70 illustrations on this subject alone.

**Electric Starters, Generators and Lighting Systems**—up-to-date and simplified—how to care for and adjust.

**Six, Eight and Twin Six Engines**—every detail simplified.

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**Repairing**—This subject has been greatly improved and enlarged—everything you want to know, from building and equipping a garage for home or business, to repairing.

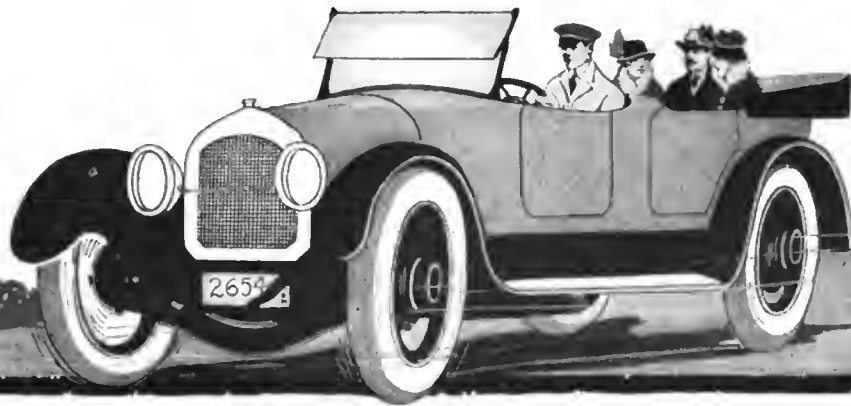
**Digest of Troubles**—You will understand how to diagnose troubles by a process of elimination; in other words, you will become an expert. Price, \$3.00. (Add 25c. to prepay.)

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A teacher, guide and reference on everything pertaining to motoring—simple as the A-B-C's.  
It's worth ten times its cost, if only placed on the shelf and used as a reference.  
1750 illustrations—  
696 pages—  
49 instructions

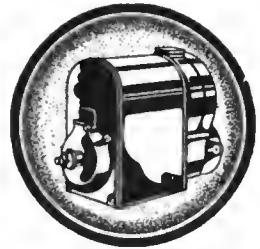
**It's Great  
to Feel Sure  
of Your Motor!**



When you KNOW every explosion will give you ALL its power—that's when motoring is solid satisfaction. The

**EISEMANN**  
MAGNETO

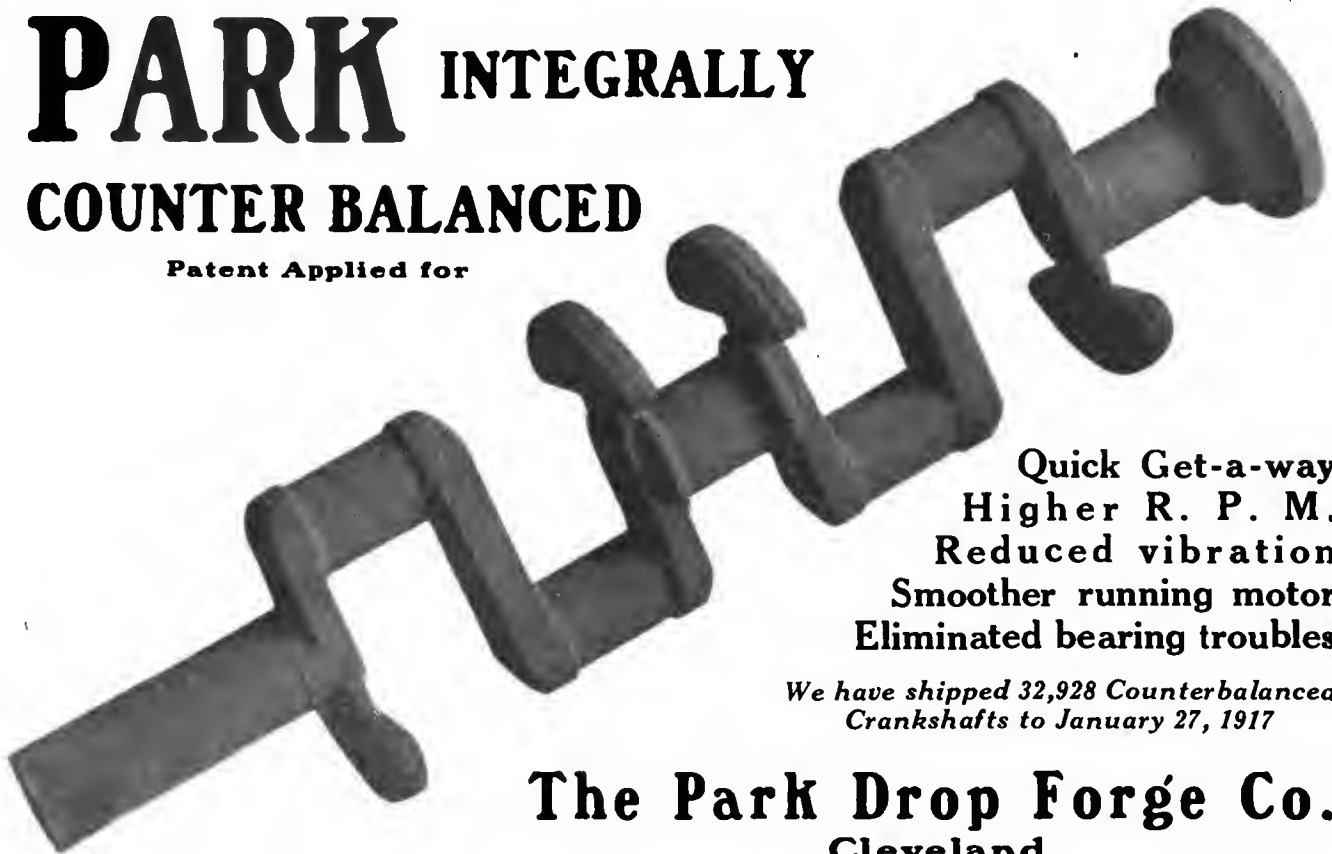
makes complete combustion certain. It drives its intense, penetrating spark through the densest compression. Mixture rich or lean, motor racing or barely turning over, you'll be sure of full power if your car is Eisemann equipped!



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Sales and General Offices, 32-33d St., Brooklyn, N. Y.  
Detroit, Mich., 802 Woodward Ave.

**PARK** INTEGRALLY  
**COUNTER BALANCED**

Patent Applied for



Quick Get-a-way  
Higher R. P. M.  
Reduced vibration  
Smoother running motor  
Eliminated bearing troubles

*We have shipped 32,928 Counterbalanced Crankshafts to January 27, 1917*

**The Park Drop Forge Co.**  
Cleveland

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## A Serious Matter to Buy Rubberized Fabrics

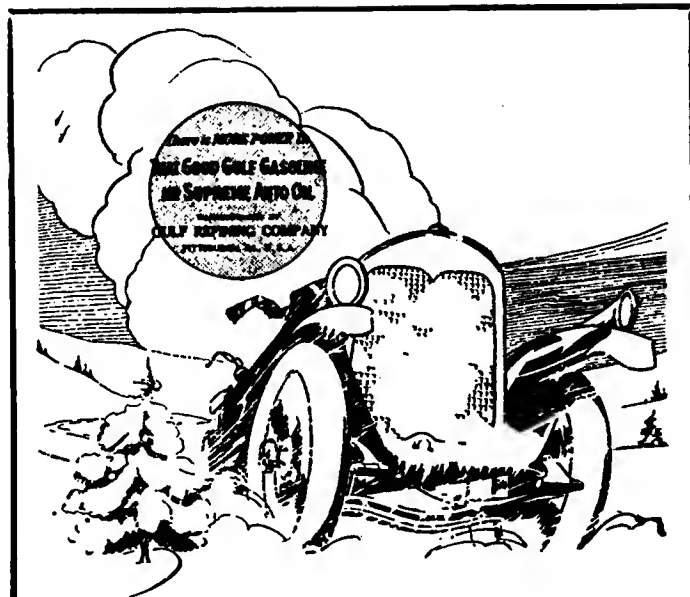
Every buyer has to meet the same problem every year. He is between two fires. He must keep up the appearance of his top and curtains, and at the same time keep his cost down to the very lowest standard.

### It is then that **BULL DOG QUALITY** in Rubberized Fabrics solves the problem

**BULL DOG QUALITY** is absolutely waterproof, and every yard manufactured is inspected most carefully, and carries a guarantee that is backed by ample responsibility. Is it any wonder that **BULL DOG QUALITY** in rubberized fabrics is used today on so many of the better cars manufactured?

Send for samples and prices, or write us your particular requirement.

**L. J. MUTTY COMPANY**  
BOSTON, MASS.



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Flows Freely at Zero. Starts with the Engine

This is most important during the winter months. You should know whether the oil you are using "flows freely at zero." All oils do not possess this feature—notably the paraffine base oils, which thicken up under cold and often cause great damage to the motor. The safe way is to ask for **SUPREME AUTO OIL**—it "Flows Freely at Zero" and leaves less carbon, owing to the fact that it is a Southern Asphalt-base oil containing no paraffine to gum, stick or thicken.

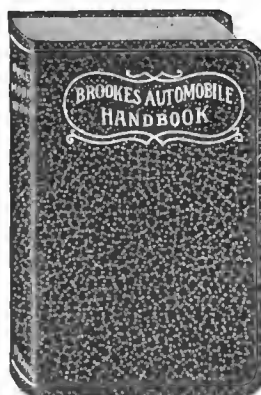
**GULF REFINING COMPANY**  
PITTSBURGH, PA.

The Largest Independent Refining Company in the World

The Most Practical Book on the Automobile Ever Published

## BROOKES' Automobile Handbook

(NEW EDITION)



For the owner, repairman, garages, automobile designers and dealers. A complete encyclopedia including every subject in relation to the automobile.

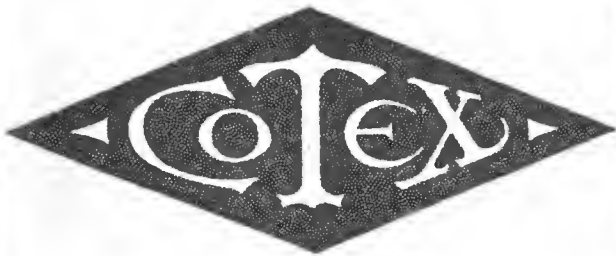
An idea of the extent of some of the main divisions may be formed from an inspection of Starting and Lighting (91 pages), Carburetor Instructions (52 pages), Transmission Systems (38 pages), Ignition (126 pages), and Engines (46 pages).

715 pages. 335 illustrations and 12 tables. Printed on plate paper.

Handsomely bound in leather, stamped in gold, red edges, round corners, pocket size.

Price, postpaid, \$2.00

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# Coated Textiles of Highest Quality

We manufacture artificial leather, or leather cloth, for upholstering and trimming automobiles.

Our product is used extensively by the largest manufacturers.

Our plant is modern in every respect and enables us to manufacture a uniformly high-grade product.

We make special goods for special purposes, and



will solve your upholstery problems.

We invite inquiries.

**The Cotex Company**  
NEWARK NEW JERSEY

# This Is The Plug



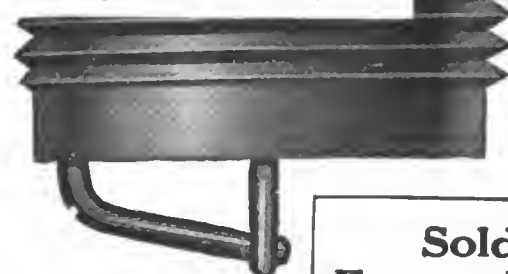
These Are  
the Manufacturers Who  
Equip With



*The Standard Spark Plug of America*

Cadillac	Oldsmobile	Paterson	Netco Trucks
Pierce-Arrow	Jeffery	McFarlan	Moreland
Packard	Kissel Kar	Westcott	Trucks
Marmon	Premier	Lexington-	Pilot
Hudson	Knox	Howard	Singer
Chalmers	Jordan	Brockway	Stephens
Hupmobile	Liberty	Truck	United Truck
Chandler	Crane	Chase Truck	Willcox Truck
Haynes	Simplex	Daniels	Signal Trucks
Chevrolet	Stearns-	Federal	Republic Truck
Dort	Knight	G. M. C.	Sandow Truck
Cole	Saxon	Gramm-Bernstein	Sterling Truck
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Palgo	National	Murray	Pathfinder
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No Greater Recommendation Can Be Given a Spark Plug  
Champion Ignition Co., Flint, Mich.



**Sold  
Everywhere**

Have You This  
Plug On Your Car?

Accept No Plug Unless AC is Burnt Into the Porcelain

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## Smooth As a Swing

Youngsters the world over don't love to swing for the exercise it gives them. It's the smooth, exhilarating "ride" that makes a length of rope and a board seat the height of every kid's ambition.

With

# W & C

## The Original Double Arm Shock Absorber for Ford Cars

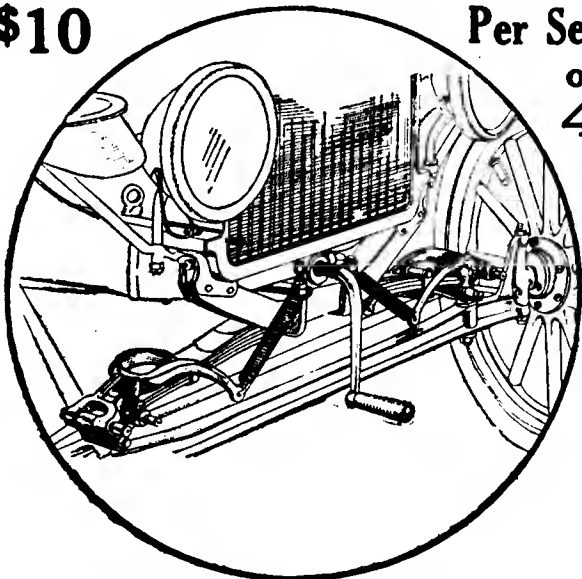
—you get a ride in your Ford that's as smooth as a swing. Even bad winter roads don't matter. W & C smooths them out from Maine to California. Once installed, W & C Shock Absorbers are never removed—unless it is to put them on the new Ford. Try them yourself—and see.

An opportunity is still open for a few more dealers to profit by W & C big sales. Write.

**PHILIP H. WEBBER & CO.**  
HOOPESTON, ILLINOIS

**\$10**

Per Set  
of  
4



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FORTY - THIRD ST., NEAR BROADWAY



Located just off Times Square

## The Hotel Woodstock

is within a handy walk of everything—terminals—subways—elevateds—surface lines—theatres and the automobile district, yet you can have quiet, refinement and service withal.

Single Room, with Bath . . . \$2.00 and \$3.00 for one  
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and \$5.00 for two

European plan restaurant  
unexcelled for its cuisine

Service and accommodations unsurpassed for completeness and efficiency

Write for our Map of New York

W. H. VALIQUETTE  
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## QUALITY RADIATORS

FOR  
PLEASURE CAR  
AND  
HEAVY DUTY SERVICE

**G & O MFG. CO.**

NEW HAVEN

CONN.

Engine Hardly Running

**THEN**

Racing Speed

These are the possibilities with

HIGH TENSION  
**SIMMS**  
MAGNETOS

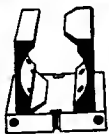
Because when creeping along the most intense spark is in the retard but at high speed in the advance—just what you want and the engine needs.

Think of the added flexibility and increased power.

*Write for literature*

**THE SIMMS MAGNETO CO.**

273 No. Arlington Ave.  
East Orange, N. J.



The

**NAFRA**

**Warning Signal**

**Brought Comfort and Pleasure To This Car Owner, Who Says:—**

*Brooklyn, N. Y., Jan. 10, 1917.*

*"I beg to thank you for your favor of January 9th, and in reply would say that my experience with the Signal has been one of both comfort and pleasure, and has not given the slightest trouble, and has worked perfectly since it was applied to the car.*

*"My man removed it from the touring car and readjusted it on the closed car, and I find it more valuable on the closed car than on the touring car. I shall be pleased at any time to have any of your intending purchasers call me on the telephone for a personal opinion on the matter." Yours very truly,*

*(Name on request.)*

The Nafra soon becomes a necessity to the car owner who uses it. He comes to depend upon it—and it deserves his confidence because it works automatically and unfailingly. Its brilliant red waving disk by day, or its bright red waving light at night, signals the car behind. "Danger! Going to slow down!" It is collision insurance of the safest, most economical class. Put a Nafra on your car, and be safe.

Dealers:—The Nafra is a quick, sure seller. Send today for prices and discounts.

**The Nafra Company, Inc.**

120 Broadway, New York

**BOSSERT**

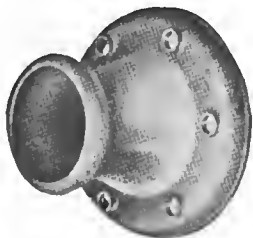
In the most perfect plant that brains, money and experience could devise, we have the men and equipment to produce pressed steel parts in any quantity on comparatively short notice.

We make more than 200 pressed steel parts and you can make your vehicles lighter and at lower cost, without sacrificing strength if you use *pressed steel* spring hangers, running boards, brake drums, etc., instead of malleable iron, steel castings and drop forgings.



**"THE BOSSERT WAY"**

stands for the prompt delivery of your order filled in accordance with every item of the specifications.



**The Bossert Co.**

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**THE MORE A MAN KNOWS**  
 about motors the higher is his opinion of the Wisconsin. In design, in materials, in workmanship, Wisconsin Consistent Motors are unexcelled. Our attention is fixed on keeping the quality up, not on speeding production up.  
 Write for specifications of motors for pleasure cars, trucks or tractors.

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**Electric Starting and Lighting Systems**  
**SINGLE UNIT and TWO UNIT Equipments**  
*Booklet on Special Ford Equipment*  
**DYNETO ELECTRIC CO., Syracuse, N. Y.**




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 They follow closely the lines of the preceding series, and the only changes are in the nature of refinements.

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- 22-73 Sporting
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**TRANSMISSIONS**  
 'The Gears of Lasting Fame'  
 Lightest, Strongest  
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 Data and prices on request.  
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 239 West 39th Street New York City

**NEW PROCESS**  
**DIFFERENTIALS and ACCURATELY CUT METAL GEARS**



**NEW PROCESS GEAR CORPORATION**  
 SYRACUSE, N. Y.



**NEW DEPARTURE BALL BEARINGS**  
 American Made for American Trade  
 QUALITY FIRST  
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**SPRING SHACKLE  
BOLTS**

**HUB CAPS**

**METAL STAMPINGS**

**IN LARGE QUANTITIES**

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### BRASS CASTINGS

in the Rough, Polished or Nickel Plate

including Hub Caps, Radiator Filler Necks with Caps, Gasoline Tank Flanges with Caps, Gasoline Tank Flange for Outlets, Hood Yoke, Ford Special Hub Cape and other parts made of Cast Brass.

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230 Mentor St.



### Without Batteries


a Model T or TK



## MAGNETO

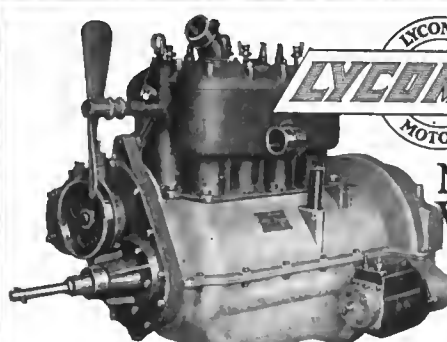
will start any automobile or truck motor—on first lift of crank. Operates on inductor principle. Oil, dirt and oil-proof construction. Operates any number of cylinders up to 12. Write for catalog and full information.


Remember a K-W Magneto Fires Any Kind of Fuel



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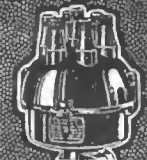
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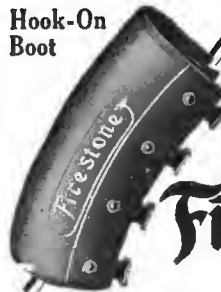
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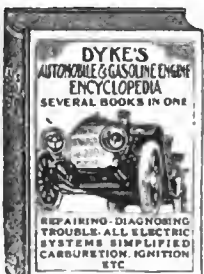
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Sizes	Tires Plain	Red 9 Ply Tubes
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30 x 3½	6.00	3.60
32 x 3½	6.25	3.65
34 x 4	7.75	5.00
34 x 4½	9.50	6.60
35 x 4½	10.00	6.75
36 x 4½	10.00	6.90
37 x 5	12.00	8.20

All Sizes from 28 x 3 to 38 x 5½ in Stock.

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Fresh Selected Stock—Standard Makes Guaranteed

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28x3	\$ 6.00	\$1.25	34x4	\$13.75	\$3.85
30x3	8.50	2.00	35x4	14.00	3.45
30x3 1/2	8.50	2.25	36x4	14.50	3.60
31x3 1/2	9.00	2.50	34x4 1/2	16.75	4.00
32x3 1/2	9.50	2.50	35x4 1/2	17.50	4.15
34x3 1/2	10.00	2.55	36x4 1/2	18.00	4.25
36x3 1/2	11.25	2.75	37x4 1/2	18.50	4.35
31x4	12.25	2.90	38x5	19.00	5.00
32x4	13.00	3.20	38x5 1/2	19.00	5.00
33x4	18.25	8.25	37x5	20.50	5.20

Add 10% for non-skid.

Bargains in Slightly Used Tires

Size	Used Tires	Used Tubes	Size	Used Tires	Used Tubes
30x3	\$ 8.50	\$1.35	35x4	\$ 8.00	\$1.75
30x3 1/2	4.25	1.45	36x4	8.00	1.75
31x3 1/2	5.00	1.50	34x4 1/2	8.50	1.75
32x3 1/2	5.75	1.50	35x4 1/2	8.50	1.80
34x3 1/2	8.00	1.90	36x4 1/2	8.75	1.85
31x4	8.75	1.85	37x4 1/2	10.00	1.90
32x4	7.50	1.60	35x5	9.00	2.00
33x4	7.75	1.70	36x5	10.00	2.00
34x4	8.25	1.70	37x5	10.25	2.20

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30 x 3	5.50	6.75	1.90
30 x 3 1/2	6.95	7.50	2.15
32 x 3 1/2	7.95	8.75	2.35
34 x 3 1/2	8.95	9.75	2.55
31 x 4	9.95	10.90	2.95
33 x 4	9.95	10.95	3.10
34 x 4	9.95	10.95	3.30
36 x 4	10.95	11.95	3.35
35 x 4 1/2	12.95	13.95	4.10
36 x 4 1/2	13.50	14.50	4.15
37 x 5	15.95	16.95	5.05

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30x3	8.50	2.00	35x4	14.00	3.45
30x3 1/2	8.50	2.25	36x4	14.50	3.60
31x3 1/2	9.00	2.50	34x4 1/2	16.75	4.00
32x3 1/2	9.50	2.50	35x4 1/2	17.50	4.15
34x3 1/2	10.00	2.55	36x4 1/2	18.00	4.25
36x3 1/2	11.25	2.75	37x4 1/2	18.50	4.35
31x4	12.25	2.90	38x5	19.00	5.00
32x4	13.00	3.20	38x5 1/2	19.00	5.00
33x4	18.25	8.25	37x5	20.50	5.20

For Non-Skid add 10% to All Prices. Special Bargains in Slightly Used Tires.

Size	Used Tires	Used Tubes	Size	Used Tires	Used Tubes
30x3	\$ 4.00	\$1.25	35x4	\$ 8.00	\$1.75
30x3 1/2	4.75	1.45	36x4	8.00	1.75
31x3 1/2	5.00	1.50	34x4 1/2	8.50	1.75
32x3 1/2	5.75	1.50	35x4 1/2	8.50	1.80
34x3 1/2	6.00	1.60	36x4 1/2	8.75	1.85
31x4	8.75	1.65	37x4 1/2	10.00	1.90
32x4	7.50	1.60	35x5	9.00	2.00
33x4	7.75	1.70	36x5	10.00	2.00
34x4	8.25	1.70	37x5	10.25	2.20

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30x3	8.21	8.96	34x4 1/2	18.03
30x3 1/2	7.98	8.32	35x4 1/2	18.72
32x3 1/2	9.09	10.17	36x4 1/2	18.93
32x4	12.33	18.88	37x5	25.45
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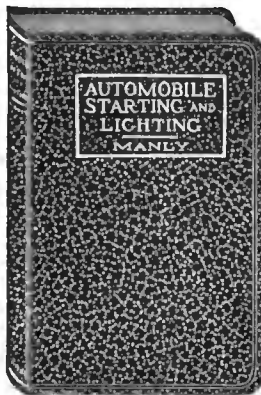
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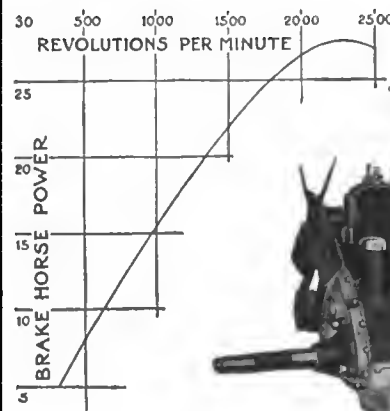
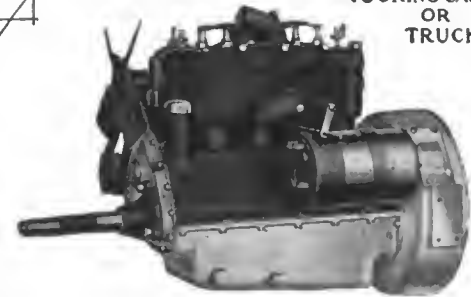
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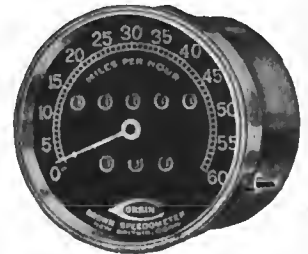
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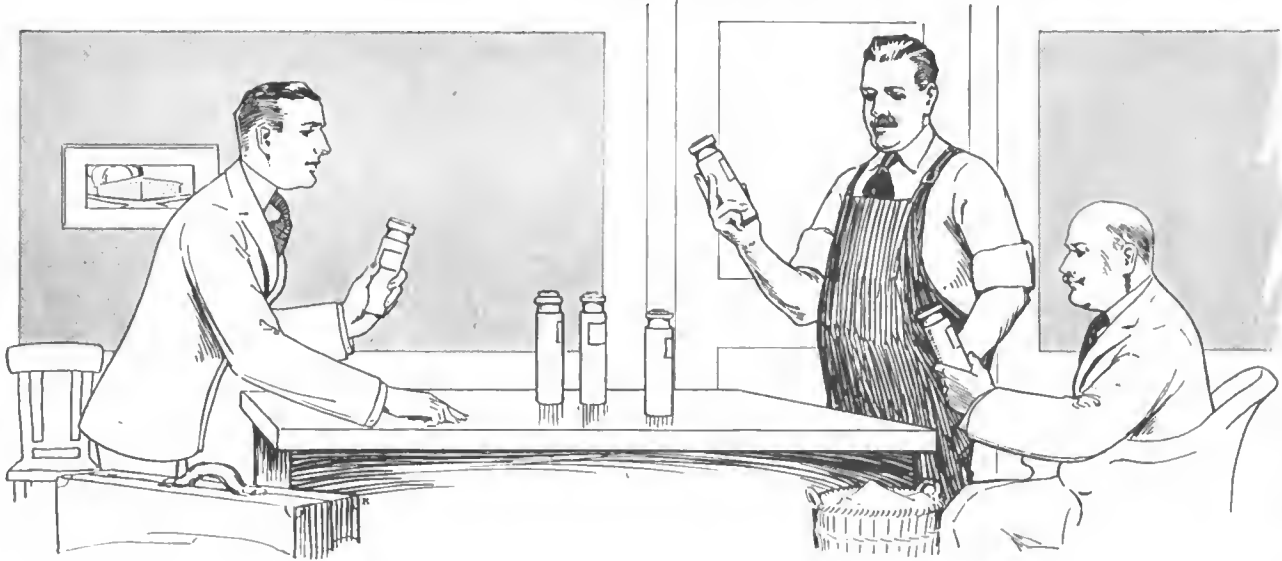
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Also special spray varnishes. Prices and full information on request.



"Gentlemen, we were first to realize that the manufacture of automobile varnishes was a science. At the end of ten years, through giving specialized study to your requirements as manufacturers of motor cars, we have perfected what we have every reason to believe is the most satisfactory and most complete line of *special* motor car varnishes made.

"AMERICAN Auto Varnishes are made to withstand to a remarkable degree the uses and abuses to which auto bodies and gears are subjected—the attacks of rain, mud, dust, heat, sun and sand—frequent washings with strong alkaline soaps—innumerable polishings with polishes of questionable composition. Consequently our auto varnishes *hold* their lustre with extraordinary tenacity. They do not readily scratch, mud spot, "bloom" nor become smoky. They are motor car varnishes expressly made for motor car purposes.

"AMERICAN Varnishes, furthermore, are rapid dryers. They help speed up production. And the big point is that, with all their special qualities, AMERICAN Varnishes cost no more than the other kind. We should like to figure on your requirements.

### The American Varnish Company

1256 Penobscot Building

DETROIT

Factory, Chicago



Overland  
TRADE MARK REG.

# Stability

**Y**OUR car is inseparable from the institution that built it.

The service it gives you is just what its producers build into it and *keep alive* in it.

In motor cars, stability of product is inseparable from the stability of the producers.

Overland ranks first among producers of cars above the \$400 class—second in the entire industry.

There are 400,000 Overlands in use.

Overland dealers have contracted for one hundred and eighty million dollars' worth of Overlands for 1917—an increase of seventy-five million dollars compared with last year.

Overland sales this year therefore will be approximately as great as the entire annual gross revenues of the New York Central Railroad.

Overland net assets have grown from *fifty-eight thousand* dollars eight years ago, to over *sixty*

*eight million* dollars today.

In our great Toledo plant and our allied plants we employ nearly thirty-eight thousand men.

They directly support more than two hundred thousand people.

Permanent well appointed factory branches and parts depots representing an investment of millions have been established in important metropolitan centers that cover the country.

These branches serve the five thousand Willys-Overland dealers who complete our great international service system.

These tangible evidences of the stability of the Overland Industry are your best assurance of stability of quality and service in Overland Automobiles.

The Willys-Overland line is now *complete*.

And it is the only complete line of cars built and sold—

—under one executive management.

—with one engineering staff,  
—with one purchasing power,  
—by one production management,  
—through one sales force, and  
—one group of dealers.

Resulting economies amounting to millions of dollars, reduce the cost of every car—enable Overland to establish and maintain higher quality standards at lower prices.

So in your Overland you get maximum quality at minimum price—plus stability, to assure permanence of value in your investment.

You can select a car in the light four group, the big four group, or the light six group.

You can select one of the cars in the luxurious Willys-Knight group.

In either case it is dominant value in its class, for it has shared in economies of Overland bigness and stability.

See the Overland dealer now and make your selection.

Light Four  
Touring - - \$665  
Roadster - - \$650  
Country Club - \$750

Big Four  
Touring - - - \$850  
Roadster - - - \$835  
Coupe - - - \$1250  
Sedan - - - \$1450

The Willys-Overland Company,  
Toledo, Ohio

Manufacturers of Overland and Willys-Knight  
Automobiles and Light Commercial Cars

"Made in U. S. A."

Light Six  
Touring - - - \$985  
Roadster - - - \$970  
Coupe - - - \$1385  
Sedan - - - \$1585

Willys-Knight  
Four Touring - - \$1285  
Four Coupe - - \$1650  
Four Sedan - - \$1950  
Four Limousine \$1950  
Eight Touring - \$1950  
All prices f.o.b. Toledo

# The AUTOMOBILE

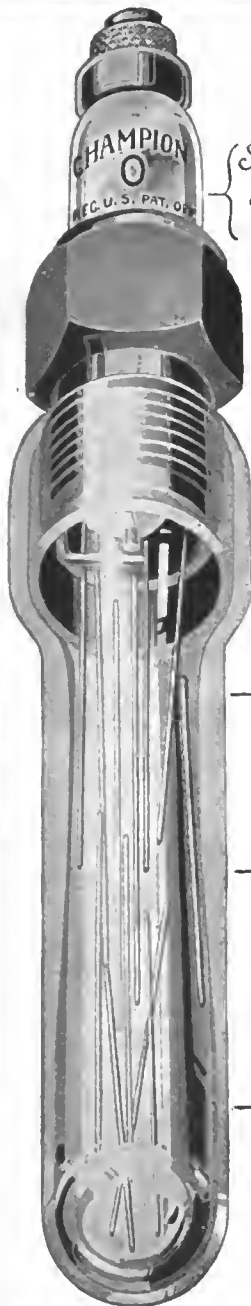
Maud L'Anphere Crook

Stanford University, Cal.

NEW YORK, FEBRUARY 15, 1917

Vol. XXXVI  
No. 7

Ten cents a copy  
Three dollars a year



Patent Pending  
Reg. U. S. Pat. Office.

PRICE  
**75c**

## Clean Your Plugs This Easy Way

Fill the tube half full of gasoline — screw the plug into the bushing at the end—then shake.

That's all you have to do to clean your plugs when you use the

## CHAMPION "MINUTE" SPARK PLUG CLEANER

In a minute or two you can clean a whole set.

Think what an improvement over the dirty, grimy task it used to be!

You don't even have to take the plugs apart.

The needles in the tube pick the carbon off the porcelain and the gasoline dissolves the oil.

The Champion "Minute" Cleaner saves a whole lot of time, temper and trouble.

It's a worry-less, work-less way of cleaning your plugs.

You want a Champion "Minute" Cleaner. Get one now.

It comes packed in a wooden carrying case.

For sale by your jobber or dealer. If not, please write to us.

**Champion Spark Plug Company**  
800 Upton Avenue Toledo, Ohio

Manufacturers of Champion Toledo Spark Plugs

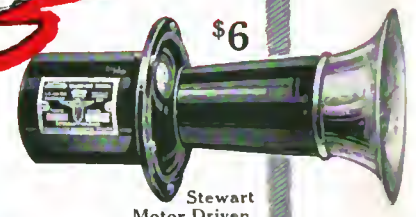


# Stewart PRODUCTS



\$3.50

Stewart Hand Operated Warning Signal



\$6

Stewart Motor Driven Warning Signal



\$1

Stewart V-Ray Spark Plug



\$10

Stewart Vacuum System



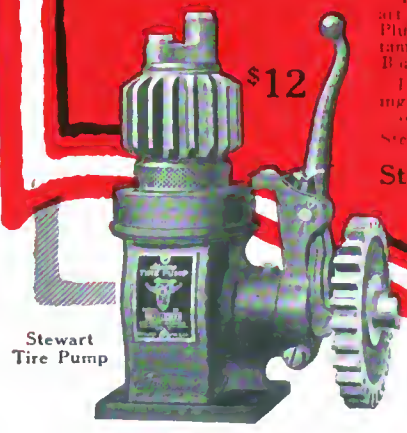
\$10

Stewart Speedometer for Fords



\$25

Stewart Speedometer



\$12

Stewart Tire Pump



\$50

Warner Auto-Meter

## There Is Money In Accessories

Put your accessory business on a big paying basis. You can make a lot. Make your accessory department the most profitable by handling only standard accessories of known value accessories that virtually sell themselves.

Stock up with Stewart Products. They are best known, best advertised, and easiest to sell.

As a Stewart dealer, you tie to Stewart access and Stewart advertising, both the biggest in the accessory field. You get added prestige and an accessory business that's decidedly worth while.

And remember, Stewart Products make the hardest competition.

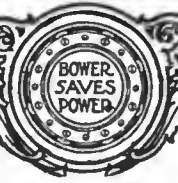
Take the Stewart Tire Pump, for instance. It is standard equipment on many of the best cars. It is the one tire pump recognized by the motor car industry. Consequently, it is the easiest to sell and hardest to compete with.

The same is true of the Stewart Warning Signals, Stewart Vacuum System, Stewart Speedometer, V-Ray Spark Plugs and all other Stewart Products, including the famous combination Stewart Speedometer and Instrument Board for Fords, selling for \$11.25.

Don't waste your time, money and efforts trying to sell unknown, unadvertised accessories.

"It will pay you to see that every car is Stewart equipped!"

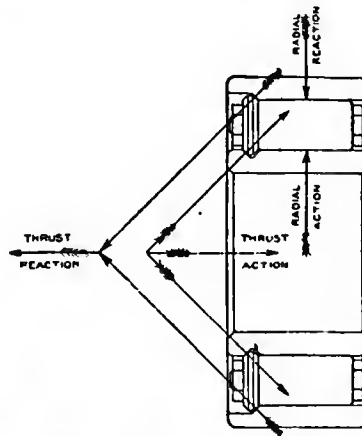
Stewart-Warner Speedometer Corporation  
Chicago U. S. A.



# *A Separate Surface for Every Kind of Thrust*

Bower Bearings are designed and constructed to minimize wear, to reduce care and attention to the simple act of keeping them lubricated and to absolutely eliminate the necessity of any adjustment.

The straight roller carries the vertical load and the flanged head takes care of the end thrust. It is because of this division of the work and because the rollers are self-aligning that Bower Bearings will be the last part of any of the car to wear out.



# BOWER

**ROLLER BEARING CO.**  
**Detroit Michigan**

# The Talk has Turned to Equipment



"Now, gentlemen," said the General Manager of a large motor car factory, "the success of our car has been built up by sincerely studying where improvements could be made in efficiency, durability and quality refinements.

"What about bearing equipment on our new models?"

"I am convinced that this matter of bearings is vitally important," replied the Sales Manager. "From the standpoint of the purchaser of the car, and as a selling proposition, ball-bearing equipment—a full jeweled job, giving every rotating part in the chassis the frictionless movement of a full jeweled watch—has a decided selling advantage. I submit that we equip throughout with ball bearings."

"I second that recommendation," said the Advertising Manager. "For ball bearings throughout will be an added and convincing publicity feature in the sale of our car."

"What do you say, Mr. Engineer?" inquired the General Manager.

"It certainly follows the best engineering practice," replied the Engineer. "Ball bearings reduce frictional resistance and wear to the vanishing point, give longer life to every part of the machine, successfully resist shocks, thrusts, stresses, from any and all directions. In my opinion, ball bearings in our car mean chassis perfection."

And the Master Mechanic added: "Yes, and ball bearings are a complete, self-contained unit that never require adjustment, are absolutely trouble proof, and offer the advantage of comparatively inexpensive installation, assembly and upkeep."

*This conversation is interesting to every dealer and car owner, for*

## NEW DEPARTURE BALL BEARINGS

*mean not only mechanical perfection, but highest efficiency in service and lowest operating and upkeep cost.*

*Send for the interesting booklet "New Departure Ball Bearings and What they mean to the Car Owner."*

**THE NEW DEPARTURE MANUFACTURING CO.**  
BRISTOL, CONN. 818-20 FORD BUILDING, DETROIT

**The AUTOMOBILE**  
 THE CLASS JOURNAL COMPANY  
 231-241 W. 39th STREET NEW YORK CITY  
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# "NORMA" BALL BEARINGS

(Patented)



In this respect machines are like men—their worth lies in their capacity for bearing responsibilities. Upon the magneto and lighting generator rests the responsibility for the satisfactory performance of a car or truck. And it is a significant fact that, almost without exception, those electrical accessories having the highest reputation for dependability, used upon cars of the highest repute, are insured against bearing trouble by means of "NORMA" Bearings. Which simply means that "NORMA" Bearings are known to be trustworthy bearings—and their presence in a magneto or lighting generator is an evidence of that quality which makes for long service.

**Be Sure—See That Your  
Electrical Accessories  
Are "NORMA" Equipped**



**THE NORMA COMPANY OF AMERICA**  
 1790 BROADWAY NEW YORK  
*Ball, Roller, Thrust and Combination Bearings.*

Please mention The Automobile when writing to Advertisers

**Studebaker**  
Established 1852

## Endorsed by the whole Industry but unequalled in VALUE, dollar-for-dollar of the price !

No man entering the motor industry can overlook a line that so thoroughly dominates the market as does Studebaker with the new Series 18 cars.

The best proof of Studebaker's great value is to be found in the industry's own figures. The comparative analysis recently made by the leading trade publications shows, in cold figures, that the motor car prospect who wants all the essentials that a Studebaker offers cannot obtain them in any other car without paying hundreds of dollars more.

Studebaker not only gives the buying public what it wants—but also what the whole industry approves as good engineering practice. That's why over 6500 of the country's most progressive men find it profitable to represent Studebaker—because it pays to be a Studebaker dealer.

### STUDEBAKER

SOUTH BEND, IND.

DETROIT, MICH.

WALKERVILLE, ONT.

*Address all correspondence to Detroit*

**The car that the Studebaker Dealer sells  
combines more of the most popular and  
saleable features than any other car—at a  
price that makes it the great value of 1917**

It pays to be a *Studebaker* dealer

Please mention The Automobile when writing to Advertisers

# The AUTOMOBILE

## Chandler Earns \$24.51 on Stock

Dividends Totaled \$700,000—  
Surplus \$1,190,786—Gross  
Profits \$2,401,862

CLEVELAND, Feb. 13—A net profit of \$1,716,166 is reported by the Chandler Motor Car Co. in its report for the year ended Dec. 31. This is equal to \$24.51 per share of stock. The company paid cash dividends aggregating \$700,000 on the \$7,000,000 capital stock outstanding and added the balance of \$1,016,166 to surplus.

Gross profits from the sale of its cars and parts, after deducting cost of labor, material and manufacturing expense, was \$2,401,862. Interest and other miscellaneous income was \$31,907, making total income \$2,433,769. Selling, advertising and general expenses amounted to \$717,604, which left the balance of net profits at \$1,716,165.

Orders on hand for delivery of cars during 1917 are 50 per cent greater than its entire production of 1916. F. C. Chandler, president of the company, in his remarks to the stockholders said in part: "New improved fireproof buildings have just been completed which double the floorspace and which will enable the company to take care of the increased production necessary to supply the growing demand for Chandler cars. The foreign business has shown a wonderful development, and we look forward to a very large business from this trade."

The condensed balance sheet of the company, at the close of business Dec. 31, 1916, appears in adjoining column.

### Rickenbacher Back in U. S.

NEW YORK, Feb. 14—Eddie Rickenbacher arrived in this city from Wolverhampton, England, on Monday, after a visit of over 2 months in Europe to purchase two racing cars for this year's campaign. Rickenbacher was at the

Sunbeam plant for some time where he superintended the building of two six-cylinder, 150-hp. racers of 300 cu. in. displacement.

Mr. Rickenbacher states that if war is declared the cars will be left in England. They are equipped with aviation motors and aluminum bodies. One of the engines was tried out on the Brookland's track and a lap was made at the rate of 119 m.p.h. Mr. Rickenbacher will leave this city for Detroit and other cities and will be on the Pacific Coast for some time. He will return to this city in 3 weeks.

### Federal Truck Capital \$2,000,000

DETROIT, Feb. 13—The stockholders of the Federal Motor Truck Co. met here to-day, and voted to increase the capital from \$500,000 to \$2,000,000. The increase entails distribution of a stock dividend of 100 per cent through transfer, of \$500,000 of surplus to the capital account. All of the officers and directors of the company were re-elected.

### Dunlap Leaves Export Business

DETROIT, Feb. 13—C. H. Dunlap, former export manager for the Hupp Motor Car Co., has resigned the vice-presidency of an export company with which he has recently been connected, and gone to California. The change is made because of war conditions. Mr. Dunlap will announce his plans in the near future.

### CHANDLER BALANCE SHEET

Assets	
Land and buildings.....	\$475,062
Good will .....	5,000,000
Cash .....	1,800,422
Customers' notes .....	14,215
Customers' accounts .....	53,181
Cars sold for export.....	123,287
Merchandise inventory .....	1,876,983
Taft Avenue Construction Co. stock.....	32,000
Advances to manufacturers.....	72,867
Prepaid expenses, etc.....	30,830
<b>Total .....</b>	<b>\$9,478,849</b>
Liabilities	
Unpaid purchases and expenses.....	\$905,798
Dealers' deposits .....	113,928
Dividend payable Jan. 2, 1917.....	210,000
Accrued taxes, etc., not yet due.....	53,122
Reserve for contingencies.....	5,214
Capital stock outstanding.....	7,000,000
Surplus .....	1,190,786

## Miller Sales Total \$7,583,605

1916 Increase from \$3,216,000—  
Earnings \$952,952 in  
15 Months

AKRON, Feb. 14—The Miller Rubber Co. increased its total sales from \$3,216,000 in 1915 to \$7,583,605.95 in 1916 with prospects from \$10,000,000 to \$12,000,000 sales for 1917.

The 1916 figures are for 15 months; owing to a change in the fiscal year. The company doubled the factory and land holdings in 1916. It is at present erecting a seven-story building.

The surplus on Oct. 1, 1915, was \$831,746.99. Earnings on Oct. 1, 1915, to Dec. 31, 1916, were \$952,952 with a total of \$1,784,699 less the common stock dividend of \$1,000,000 depreciation and expenses of increased capitalization of \$232,795.84 and dividends of \$259,958. With a total of \$1,592,753.94, the surplus on Dec. 31, 1916, was \$291,945.

The company will issue \$500,000 in new common stock. Present shareholders will have the right to purchase shares of the new stock at par.

### To Relieve Detroit Coal Situation

DETROIT, Feb. 13—Detroit is just keeping ahead of collapse so far as coal is concerned. The Detroit Edison Co., which announced Monday that it had sufficient coal to keep running until Thursday without shutting off power from factories, hopes to extend the time when the coal en route to-day has been checked. All of Detroit is economizing in power as much as possible and a number of companies have made short shutdowns. Among them is the Michigan Steel Castings Co. which closed Monday and will resume operations Wednesday if the shortage is relieved. This company uses a considerable amount of power from the Edison Co. in operating its plant.

## Mitchell 1916 Income \$1,188,398

Equal to \$9.50 a Share—Surplus Is \$361,619—Dividends Total \$187,500

RACINE, WIS., Feb. 14—The Mitchell Motors Co., this city, in the year ending Oct. 31, 1916, reports a net income of \$1,188,398, equal to \$9.50 a share on the 125,000 shares of stock outstanding. The surplus amounted to \$361,618, after paying dividends of \$187,500.

The income account is as follows:

Net operating profits.....	\$1,282,762
Other income .....	119,354
<b>Total income .....</b>	<b>\$1,402,116</b>
Taxes, extraordinary expenses and interest .....	213,718
<b>Income for year.....</b>	<b>\$1,188,398</b>
Mitchell-Lewis Motor adjustment...	514,142
<b>Balance .....</b>	<b>\$674,256</b>
Special reserves .....	125,137
<b>Balance .....</b>	<b>\$549,119</b>
Dividend paid .....	187,500
<b>Surplus .....</b>	<b>\$361,619</b>

The balance sheet as of Oct. 31, 1916, follows:

Assets	
Cash .....	\$514,843
Notes and accounts receivable.....	491,726
Inventories .....	2,729,598
Deferred charges .....	34,072
Real estate, etc .....	2,501,632
Investments .....	41,073
<b>Total .....</b>	<b>\$6,312,947</b>
Liabilities	
Accounts payable .....	\$676,369
Dividends payable .....	187,500
Accrued wages, taxes, etc.....	4,184,032
Debtenture notes .....	275,000
Reserves .....	110,000
Contingent items .....	175,000
Notes receivable, discounted.....	29,863
Capital in surplus, May 31.....	4,518,427
Surplus as annexed.....	361,618
<b>Total .....</b>	<b>\$6,312,947</b>

### Cochrane with General Motors Truck Co.

DETROIT, Feb. 9—W. B. Cochrane has joined the forces of the General Motors Truck Co. of Pontiac, and will be in charge of Pacific coast business.

### Myers General Engineering Co. Director

DETROIT, Feb. 9—T. P. Myers has been elected a director of the General Engineering Co. He is sales manager.

### Cook on Goodrich Executive Staff

AKRON, Feb. 9—C. E. Cook has been appointed to the executive staff of the central office of the B. F. Goodrich Co. in Akron. He has been Pacific Coast manager for the company. Frank R. Carroll has been put in charge of the Coast territory. He was formerly manager of the Los Angeles branch.

### Senate Caucus Quashes Webb Bill

WASHINGTON, Feb. 11—At attempt to attach the Webb bill as a rider upon the revenue bill was defeated in the Democratic caucus of the Senate held yesterday. It is believed that this kills the chances of this measure passing during

the present session. The proposed law would allow corporations to form joint selling agencies for foreign trade purposes.

Secretary Patchin of the Foreign Trade Council in New York interviewed Senators yesterday, and Senator Lewis made the proposal to tack the Webb bill on the revenue act. The suggestion was opposed strenuously, certain Senators saying that they would talk indefinitely and prevent it from coming to a vote if the measure appeared in the Senate.

### Price Leaves Overland Sales

CHICAGO, Feb. 10—Charles W. Price has retired as distributor of Overlands in Chicago and surrounding territory and, at his request, the Willys-Overland, Inc., Toledo, has purchased his interest in the Overland Motor Co., the local distributing organization. Price's retirement has been caused by health conditions and outside financial interests. Joseph H. McDuffee, assistant sales manager at the Overland plant, has been placed in charge of the Chicago business.

### Olympian Motor Co. Doubles Capital

PONTIAC, MICH., Feb. 9—The Olympian Motor Co. has increased its capital from \$1,000,000 to \$2,000,000 for general expansion purposes.

## Aeroplane Makers Unite for Defense

### Fifteen Form Aeronautic Mfg. Assn.—Output 175 Planes Weekly

NEW YORK, Feb. 12—Fifteen aeroplane manufacturing companies joined forces for the defense of the United States at a meeting in the Hotel Manhattan yesterday afternoon. The new league took the name of the Aeronautic Mfg. Assn. The members have a combined investment of \$30,000,000 and can turn out 175 aeroplanes weekly if need be.

Harry Bowers Mingle of the Standard Aero Corp., president of the association, sent the following telegram to President Wilson:

"Aeronautic manufacturers have today organized for the purpose of cooperating with the government. We pledge our full support and place our combined efforts and resources at your command."

The firms represented were: International Aircraft Co., Bourges Co., Curtis Aeroplane Co., Thomas Morse Aircraft Co., F. H. Flint Engineering Co., United Eastern Aeroplane Co., Gallaudet Co., Brook Aircraft Co., General Aeroplane Co., American Motoplane Co., Aeroplane Company, A. S. Heinrick Corp., Standard Aero Corp., F. F. Pierce Aero Corp., and Benoist Corp.

## S. A. E. Aero Session Success

### Standards Appreciated—War Films Shown—Talks on Gyroscope, Engines and Wings

NEW YORK, Feb. 10—The first aviation session of the Society of Automotive Engineers held yesterday proved an unqualified success. The two papers on standardization given in the afternoon evoked a vigorous discussion of which the most striking part was the obvious readiness of the aeroplane manufacturers to draw upon the store of experience and standards possessed by the automobile industry. There is no need for standards propaganda as there was when automobile standards were first proposed. On the other hand, the aviation industry is calling out for standards, fully appreciating the benefits which would result from their use, benefits not so much of price as quick supply and rapid replacement.

In the evening a crowd of over 350 gathered, and there were shown again the series of war films, which were a feature of the winter meeting of the society. These were followed by Mr. Sperry's paper on "Air Navigation Over Water." Mr. Sperry did not read the paper, but talked on the gyroscope and his various inventions, explaining clearly the operation of the different devices.

Following him, Prof. Pawlowski read his paper on "Wing Construction," which is reprinted elsewhere in this issue, and finally Leigh M. Griffith delivered his paper on "Aeroplane Engine Construction," which was digested very fully in the last issue of THE AUTOMOBILE.

### Good Discussion

This paper was discussed more vigorously than either of the others, since there were a larger number present qualified to speak on the subject at issue. The majority of Mr. Griffith's contentions were not assailed, very few of the speakers apparently caring to commit themselves to the expression of any very different opinions. The discussion showed a distinct tendency to center about the spark plug as being the weakest spot in the present day aviation engine, and there seemed the general view that some drastic changes would have to be made, that mere petty improvement of the spark plug as we know it is not going to prove the final answer.

### Innes Factory Manager of Chevrolet

DETROIT, Feb. 10—H. L. Innes has joined the Chevrolet Motor Co. as factory manager. His resignation from Dodge Bros. was recently reported in THE AUTOMOBILE.

## M. & A. M. Attacks Revenue Bill

### Admits Aeroplane Motor and Parts Makers to Membership—Reviews Morrison Act

NEW YORK, Feb. 13—"An additional unwarranted and burdensome tax upon industry" is the Administration's revenue bill, in the opinion of the executive committee of the M. & A. M. as stated at the monthly meeting held in New York headquarters last week. The claim is that the burden will fall heavily on a few States at first.

It was decided to admit aeroplane motor parts and accessories makers to the society. The Morrison bill proposing a Federal bureau for the registration of design was referred to Christian Girl, W. O. Rutherford, and James H. Foster to determine what attitude the association would take after a canvass of the membership. Dayton Engineering Laboratories Co. and the Parker Rust Proof Co. of America, Detroit, were admitted to membership.

### Stoll General Motor Truck Sales Mgr.

PONTIAC, MICH., Feb. 9—O. E. Stoll has been appointed sales manager of the General Motor Truck Co. He will direct the selling policies over Pontiac. He succeeds W. K. Chilcott. Mr. Stoll has been manager of the company's Philadelphia branch.

### Higbie and O'Hara Hayes Directors

DETROIT, Feb. 10—C. Higbie and J. F. O'Hara have been added to the directorate of the Hayes Mfg. Co.

### Allen Manages Hall Kenosha Factory

KENOSHA, WIS., Feb. 10—C. E. Allen will manage the factory at Kenosha of the C. M. Hall Lamp Co., which the company now operates following its purchase from the Badger Brass Mfg. Co. He has been superintendent of the Detroit plant.

### Hodge Heads Traffic Committee

DETROIT, Feb. 9—The Detroit traffic committee of the National Automobile Chamber of Commerce held its monthly meeting yesterday. New car service rules as formulated by the railroad and approved by the interstate commission were submitted to the committee by J. S. Marvin, general traffic manager of the N. A. C. C., and were discussed. The committee believes that the new rules will be valuable to the industry since they will enforce the home routing of cars.

Election of officers for the committee

was held, and the following were selected for this year: E. N. Hodges, traffic manager of the Hupp Motor Car Co., chairman; J. A. Gardner, traffic manager of the Hudson Motor Car Co., vice-chairman; Hugh Higginbottom, traffic manager of Dodge Brothers, secretary. Among the factories represented at the meeting were the Willys-Overland Co., Chalmers Motor Car Co., King Motor Co., Hudson Motor Car Co., Cadillac Motor Car Co., Anderson Electric Car Co., Studebaker Corp., Hupp Motor Car Co. and Dodge Brothers.

### Ball in Milwaukee Engineering School

MILWAUKEE, WIS., Feb. 12—J. D. Ball, Schenectady, N. Y., late of the consulting engineering department of the General Electric Co., and assistant to Dr. Charles P. Steinmetz for the past 9 years, has accepted the appointment of professor of electrical engineering in the Milwaukee School of Engineering. Mr. Ball is a graduate of the University of Illinois and a member of the American Institute of Electrical Engineers.

## Three More Makers for Cleveland

### Companies Manufacture Automobiles, Trucks and Electric Vehicles, Respectively

CLEVELAND, Feb. 9—Three automobile manufacturers will move their factories from Michigan to Cleveland next fall. One company is planning to manufacture touring cars, another will turn out trucks of extra heavy pattern, and the third will manufacture electric vehicles. These concerns follow on the heels of the Grant, Abbott and Hal companies, which have moved from other cities here within 6 months. One of the three manufacturers, whose names must be withheld at this time, is among the largest automobile makers in America.

### Thompson Is Stutz General Manager

INDIANAPOLIS, Feb. 13—William N. Thompson, sales manager of the Stutz Motor Car Co., has been made treasurer and general manager of the company, succeeding the late Henry F. Campbell. His place is taken by Thomas Marshall, formerly with the Stutz company and more recently with Willys-Overland, Inc.

### Jones Resigns from Empire

INDIANAPOLIS, Feb. 13—Tom Jones, export and advertising manager of the Empire Automobile Co., this city, has resigned. He will sail for London to become affiliated with a large export house. Mr. Jones was formerly connected with the Marion and R-C-H companies.

## More Car Factories for War Use

### Peerless, Studebaker and Cruiser Offer Plants—Firestone Tire Volunteers

WASHINGTON, Feb. 14—Offers from automobile and other manufacturers continue to deluge the war department, stating that their facilities are at the service of the government if the occasion demands it. Peerless Motor Car Co., Cleveland, Studebaker Corp., South Bend and Detroit, and the Cruiser Motor Car Co., Chicago, have volunteered their plants during the past week.

Firestone Tire & Rubber Co., Akron, is willing to place its facilities at the service of the government, the Danubial Co. of New York, manufacturers of engineers' packing materials; the Taylor Instrument Co. of Boston, manufacturers of recording devices and gages; the Warner & Swazey Engineering Co., Cleveland; the United Glove and Rubber Mfg. Co. of Washington, and the Gray Motor Co. of Detroit are among those who have indicated their readiness to use their factories for war purposes.

The government has conferred with Christian Girl, president of the Standard Parts Co. of Cleveland, requesting the company's assistance in establishing a repair plant for motor trucks in El Paso, Tex. The government wishes the company to conduct such a service station until the war department can take it over.

### Hudson Gets Government Shell Order

DETROIT, Feb. 9—The Hudson Motor Car Co. has received a small order for shells from the U. S. Government to enable it to put in sufficient equipment to train employees for such work in event of war needs.

### Waldron to Talk on Aeronautics

DETROIT, Feb. 10—Maj. S. D. Waldron of the United States Army will speak on "Aeronautics in War" at a meeting, Feb. 16, of the Detroit chapter of the Sons of the American Revolution.

### DeCou with Smith Motor Truck

DETROIT, Feb. 12—J. W. DeCou has become production manager of the Smith Motor Truck Corp. Mr. DeCou was formerly the production manager for the Thomas B. Jeffrey Co.

### Detroit Section Nominates Waldon Chairman

DETROIT, Feb. 8—S. D. Waldron, formerly connected with the Cadillac Motor Car Co. and vice-president of the Packard Motor Car Co. in charge of engineering, yesterday received the nomina-



tion for chairman of the Detroit section of the Society of the Automotive Engineers. C. C. Hinckly, chief engineer of the Chalmers Motor Car Co., was nominated vice-chairman; G. M. Holley of Holley Bros. for treasurer; W. B. Stout, an Aircraft Motor Engineer of the Packard Motor Car Co., for secretary, and L. D. Bollon, president of the Ainsworth Mfg. Co., for section member of the National Nominating Committee. Nomination committee for the Detroit section consisted of: H. W. Alden, of the Timken Detroit Axle Co.; J. G. Vincent, of the Packard Motor Car Co., and H. A. Brown, Jr., of the Hyatt Roller Bearing Co.

#### Indiana S. A. E. To Discuss Cork

INDIANAPOLIS, Feb. 10—The History of Cork from the Tree to the User will be the subject of a paper to be read by H. W. Prentis of the Armstrong Cork Co. at the Feb. 16 meeting of the Indiana Section of the Society of Automotive Engineers in the Assembly Hall of the Claypool Hotel. In addition to this paper, Mr. Kempter of the Geuder, Paeschke & Frey Co., Milwaukee, will give a talk on pressed steel.

#### Senate Approves Taxing of Excess Profits

WASHINGTON, Feb. 13—The Democratic members of the United States Senate in caucus have approved the emergency revenue bill as it passed the House, under which bill the excess profits item appears. This item has caused a vigorous protest to be made by manufacturers throughout the country. It places a tax of 8 per cent on the net profits of corporations, joint stock companies or associations, insurance companies and partnerships, which are in excess of \$5,000 and in excess of an amount equivalent to 8 per cent of the actual capital involved. That is, before the tax attaches there is a flat reduction of \$5,000 from the total net profits and a further reduction of 8 per cent on the actual capital invested.

#### Bakelite Is Cleveland S. A. E. Subject

CLEVELAND, Feb. 13—R. P. Jackson, engineer of the Westinghouse Electric & Mfg. Co., will present a paper on Fabricated Bakelite Materials for Application on Automobiles at a meeting of the Cleveland section of the Society of Automotive Engineers. The meeting will be held Feb. 16 at the Hollenden Hotel.

#### Monroe Controls Middle West Sales

DETROIT, Feb. 14—R. O. Monroe has been made manager of the Middle West sales for the Monroe Motor Co., with offices at South Bend, Ind. He is a son of R. F. Monroe, president of the company.

## Dodge To Build Trucks

### Company Considering Plan To Add Delivery Car of Under 1000 Lb. Capacity

DETROIT, Feb. 13—Dodge Bros. will bring out a small truck. Reports have been circulated that the Dodge company has already brought out a commercial vehicle. These reports are untrue, although the Dodge company has under consideration the manufacture of a light delivery car which will probably not exceed 1000-lb. capacity.

An official of the Dodge company explained to-day that there had been urgent requests from the dealers for a small truck, and it is to meet this demand that preliminary designs for a small unit are now being formulated. Before the truck is actually built, however, a few will be made up and given an exhaustive road test so that when the design is perfected, production will be uninterrupted by errors which might have occurred due to haste. The Dodge company has discouraged the overloading of its chassis with truck bodies that are too heavy, but to meet the requirements where it has been absolutely necessary, a few chassis have been furnished which are the same as the stock passenger cars except for oversized tires, heavier springs, etc. No efforts have been made to push this side of production, however; in fact, the Dodge company has discouraged the idea as much as possible.

#### New Directors in Michigan Copper & Brass Co.

DETROIT, Feb. 13—The stockholders of the Michigan Copper & Brass Co. met here to-day and elected new officers and directors as follows:

Officers: D. M. Ireland, president; J. J. Whitehead, first vice-president; H. H. Smith, second vice-president; A. L. Simmons, secretary; John S. Connell, treasurer. Directors: C. S. Mott, of the Weston Mott Co., A. P. Sloan, of the United Motors Corp., W. P. Chrysler of the Buick Motor Co.; B. G. Goether, of the Hyatt Roller Bearing Co., J. H. Mallory; E. C. McCrone; D. M. Ireland; H. H. Smith and J. J. Whitehead.

Mr. Whitehead and Mr. Smith are new officers. All of the directors with the exception of Mr. Ireland, Mr. Whitehead, and Mr. Smith are new members of the directorate. There was no action taken on extra cash or stock dividends, though the surplus and earnings of the company are at this time understood to be equivalent to 80 per cent on its \$1,000,000 capital.

The directors have authorized expendi-

ture of \$200,000 for expansion. The company has orders booked for 20,000,000 lb. of product. The net earnings for the past year were \$972,494.75, equivalent to 87 per cent on the capital stock. The year's dividend disbursements included 125 per cent stock dividend and aggregated \$720,760, leaving an accumulated surplus of \$844,411.87. Compared with \$592,677.12 at the end of 1915, the company's balance sheet this year shows assets of \$2,181,827.89, current liabilities \$164,995.14, making a net working capital or \$1,244,613.21. There is no funded debt. The new controlling interests hold 52,000 shares of stock, and proxies covering 20,000 additional out of 11,485 shares outstanding.

#### Ford Starts Newark Plant

KEARNY, N. J., Feb. 13—The Ford Motor Co. has started construction of its plant on the New Jersey meadows adjacent to Kearny, where 80 acres of ground have been purchased. It is expected that the structure, which will be four stories, will be completed in about a year. It is stated that this location will afford better transportation facilities than the Long Island City plant which has been inadequate to supply the demand for domestic and foreign trade.

#### 197,687 Cars in Texas

AUSTIN, TEX., Feb. 13—On Jan. 1 there were registered 197,687 cars and trucks in Texas, as compared with a total of 137,807 on Jan. 1, 1916; an increase of 44 per cent.

These registration figures are not by any means complete, for the reason that there are thousands of cars in use in Texas which, in one way and another, have evaded registration. It is estimated, however, that the total number in the State is perhaps close to 215,000.

#### Happy Farmer Tractor Enlarges

LACROSSE, WIS., Feb. 12—To make possible a production of at least 2800 Happy Farmer tractors during the calendar year the LaCrosse (Wis.) Tractor Co., the recent consolidation of the Star-Rite Engine Co., LaCrosse, and the Happy Farmer Tractor Co., Minneapolis, has leased the former plant of the Summit Stove Works at LaCrosse and will use it to handle the overflow from the main plant in that city. The company started out to manufacture about 1500 tractors this year, but up to Feb. 1 had booked guaranteed orders for 2800 machines.

#### Blanchard, of Firestone, Dead

AKRON, Feb. 13—Frank Blanchard, sales manager of the Firestone Tire & Rubber Co., died Monday as the result of a serious operation.

## Batavia to Make Solid Tires

### Will Take Over Simplex Rubber Co. Patents and Property—Refinancing

BATAVIA, N. Y., Feb. 10—The Batavia Rubber Co., this city, and the Simplex Rubber Co. of America, Ossining, N. Y., will merge, and the latter company is to assign all its property, patent rights and agreements to the local company, according to an agreement just announced.

The Batavia company has for some time contemplated adding to its production solid rubber tires for trucks and also certain classes of mechanical rubber goods. The Simplex Rubber company has been operating since November, 1916, under patent license rights granted by the Simplex Rubber Co. of Willesden, England. As this company has been showing satisfactory results from its operations, the directors of the local company have arranged for the merging and sale of the company.

By the new merger the Batavia company will increase its capital stock and will issue stock in the ratio of \$85 preferred for each \$100 of Simplex preferred and \$55 of Batavia common for each \$100 of Simplex common. The capital stock of the Simplex company is \$100,000 preferred and \$200,000 common. The Batavia company is also to assume the outstanding notes of the Simplex company, amounting to about \$50,000, and also their current liabilities for materials and supplies, etc.

#### Form Rubber City Clearing Co.

AKRON, Feb. 10—The Rubber City Clearing Co. has been formed here with a capital of \$100,000, to engage in the automobile accessories business. C. E. Williams of the Williams Motor Co. filed the application for incorporation.

#### Wolverine Buys Factory Site

DETROIT, Feb. 9—The Wolverine Tractor Co. has purchased land in West Dearborn, Mich., and will erect a factory and homes for workers.

#### Ionia Body Plant at Grand Rapids

GRAND RAPIDS, MICH., Feb. 12—The Ionia Auto Body Co. has purchased one of the plants of the Heinz Pickle Co. at this city for \$85,000 and will move here in the near future.

#### Nice Ball Bearing to Build

PHILADELPHIA, Feb. 10—The Nice Ball Bearing Co., 504 Land Title Building, has purchased a large piece of ground on Hunting Park Avenue, on which it

plans to erect a building for the manufacture of ball bearings. The ground measures 987 by 528 ft. and was bought for \$71,365. The Nice Ball Bearing Co. was incorporated by Budd G. Nice and Frank Beemer less than a year ago and has since succeeded the Pressed Steel Manufacturing Co., also maker of ball bearings.

#### American Motors Starts Manufacture

PLAINFIELD, N. J., Feb. 12—Production has started at the plant of the American Motors Corp. here. W. H. Crowley, recently wholesale manager for the Saxon Motor Co. of New York, has been made a district sales manager and is on the road in New York and Pennsylvania. C. W. Govan has likewise been made district sales manager for New England and Long Island. H. M. Applegate, former advertising manager for Lee tires, will look after the advertising.

#### Western Carburetor to Build

ALMA, MICH., Feb. 10—The Western Carburetor Co., this city, recently incorporated for \$120,000, has let contracts for a factory. Machinery will be installed within 60 days.

#### Grant-Lees Addition Nearly Ready

CLEVELAND, Feb. 13—The Grant-Lees Gear Co. addition on East Sixty-ninth Street will be ready for occupancy March 1. The factory addition embraces 30,000 sq. ft., is three stories high, of concrete and steel. The new facilities are expected to turn out 100,000 transmissions yearly.

#### Duplex Truck Plans Plant

LANSING, MICH., Feb. 12—The Duplex Truck Co. has moved its executive offices from the old city hall building on East Michigan Avenue to the new Porter building at Capitol Avenue and Washenaw Street. By the latter part of August the company expects to be in its own office building at Mt. Hope and Washington Avenues. Plans are going ahead for the erection of a new factory building in this section of the city, and it is expected the building will be equipped by next fall so that the equipment in Charlotte, Mich., where the company now manufactures its trucks, may be brought here at that time.

#### Duesenberg Plant for Newark

CHICAGO, Feb. 10—The Duesenberg Motor Co., this city, it is stated, is contemplating moving its plant to the Atlantic coast, where it will go in for large production work. Negotiations have been made for a 16-acre plant in Newark, N. J., where, it is stated, through better working and shipping conditions, the company will be able to give more attention to its production of aeroplane, automobile and motor boat engines.

## Bethlehem Trucks in Two Models

### 10,000 1 1/4- and 2 1/4- Tonners for 1917—Prices Are \$1,125 and \$1,665, Respectively

ALLENTOWN, PA., Feb. 13—Two truck models have been placed on the market by the Bethlehem Motors Corp., this city, one of 1 1/4-ton and the other of 2 1/4-ton capacity. This concern, which has only been organized a few months, plans a production of 10,000 of these vehicles during the calendar year. They are of conventional design assembled from standard components and will be produced both as stripped chassis and in several standard body types. Specifications are:

Capacity, lb. ....	2,500	4,500
Price .....	\$1,125	\$1,665
Wheelbase, in. ....	126	144
Tires, front .....	34 x 3	34 x 4
Tires, rear .....	34 x 4	34 x 6
Bore, in. ....	3 3/4	4
Stroke, in. ....	4 1/2	4 1/2
N. A. C. C. hp. ....	22.5	25.6
Gear-ratio in high gear.....	7.4-1	8.8-1
Final drive .....	Internal Gear	

A Lycoming engine is used on the smaller model and a North American on the larger, both being incorporated in unit with their clutches and gearsets as unit power plants suspended at three points from the main frame. The smaller engine is block-cast and the larger cast in pairs, both having valves to the left.

Thermo-syphon water circulation through long, square-tubular, sheet-metal-cased radiators is employed on both models, and both have Bosch single magneto ignition with hand spark advance. They are not provided with governors. Gravity feed is used for the fuel line.

Both models drive through dry-disk clutches and three-speed selective gearsets, made by the Detroit Machine Co., to Russel internal-gear-driven rear axles, from which torque and propulsion are taken by the Sheldon springs.

#### McCord Completes Refinancing

DETROIT, Feb. 9—McCord Mfg. Co. of Detroit and Chicago has dissolved its \$750,000 organization; and the McCord Mfg. Co., Inc. of Milbrook, N. Y. and Detroit has been incorporated for \$1,375,000.

#### Drexel Acquires Body Equipment

CHICAGO, Feb. 10—The Drexel Motor Car Co. has now acquired full equipment of the Staver body building plant, Chicago. A section of what was formerly the Staver factory has been occupied by the Drexel concern for some time. The plant recently became the property of the Studebaker Corp., which leased part of it to the Drexel company.

## Trucks Favored in N. Y. Bills

### Scientific Report Ordered by Governor to Determine Equitable Tax

NEW YORK, Feb. 13—That motor truck owners and operators in New York state have partially succeeded in their efforts to change the present drastic Hewitt-Wells bills taxing trucks from double to fourteen times those of 1916 is manifested in the favorable attitude of Governor Whitman, who promised to create a new commission to determine a new schedule of fair and equitable fees at a public hearing recently. Arguments at this meeting were so convincingly put forth that the Governor practically agreed to form a new commission to consist of a road engineer, a state engineer and a motor truck engineer to make a scientific report on the entire matter and then report back to the Legislature for final action.

On Feb. 7, the next day after the public hearing, Senator Murphy introduced a bill into the Senate providing that such a commission be appointed by the Governor and similar action was taken by Assemblyman Law in the Assembly.

Another bill of perhaps equal importance was introduced into the Senate by Senator Slater and provides for the exemption of motor trucks and buses from local and general taxation in lieu of the present increased fees as ratified by the Hewitt-Wells bills. If the Slater bill is passed, and from indications it seems that it will, motor truck owners and operators will have much cause for rejoicing because the personal property and local taxes are of greater amount than the registration fees in practically all cases. If trucks are thus exempted from these taxes they will be in the same class as the passenger cars in the state so far as a single tax is concerned, for they have paid no personal property tax since the present tax of a fixed sum per horsepower rating went into effect several years ago.

The great benefit accruing from the exemption of local and general taxation on trucks and buses may be gaged by a comparison of one or two sizes of trucks under the flat \$5 fee per year as in 1916 and the proposed fees according to the Hewitt-Wells bill if the local and general taxes are removed. For example: a conventional 1-ton truck costing approximately \$1,650, including an ordinary body, in 1916 had to pay a registration fee of \$5 plus about 2 per cent of the valuation in local and general taxation, which amounted to \$33, giving a total of \$38.

With the present fees as scheduled and ratified by the Hewitt-Wells bill, the reg-

istration fee for the same truck, weighing between 2 and 3 tons, would amount to \$15. This shows an actual saving to the owner of \$23, provided the local and general taxes are eliminated. This saving will be proportionally increased as the size and value of the truck is increased, for the reason that the registration fees do not increase in the same ratio.

### Ostrom Resigns from Locomobile

BRIDGEPORT, CONN., Feb. 13—C. C. Ostrom, purchasing agent of the Locomobile Co. of America, has resigned to become associated with the Parish Mfg. Co., Reading, Pa., and Detroit. J. E. Forgy, present assistant purchasing agent, succeeds Mr. Ostrom.

### Sterling Tire Corp. Capital \$2,500,000

RUTHERFORD, N. J., Feb. 10—J. A. Miller of this city has incorporated in Delaware the Sterling Tire Corp., with a capital of \$2,500,000 to manufacture tires. Otto Basten of East Rutherford, and Bartlett Greene, Passaic, are also interested in the company.

### Ford Not with Export House

NEW YORK, Feb. 13—H. W. Ford, president and general manager of the Saxon Motor Car Corp., Detroit, is not a director or stockholder in the Foreign Industrial Corp., as was stated in THE AUTOMOBILE for Feb. 1.

### Russia Can Import Motor Vehicles

NEW YORK, Feb. 10—In THE AUTOMOBILE for Feb. 1 it was stated that the importation of automobiles and trucks into Russia had been prohibited. This was incorrect, as the vehicles prohibited do not include motor vehicles, the latter being covered by a special provision in the commercial treaty with France.

### Must File Standard Roller Claims

PHILADELPHIA, Feb. 9—Standard Roller Bearing Co. creditors must file their claims before Feb. 23, according to a decree handed down by Judge Thompson in the United States district court yesterday. Any objections to the proposed purchase plan must be entered before the same date. Similar decrees were filed by Judge Rellstab in the United States district court at Trenton early this week.

### Gamble Resigns from Maxwell

DETROIT, Feb. 9—T. S. Gamble, assistant sales manager of the Maxwell Motor Co., Inc., has resigned his position. Mr. Gamble will join an advertising company and have headquarters at Cleveland.

### Goodyear May Take K-S Plant

AKRON, Feb. 14—It is reported that the Goodyear Tire & Rubber Co. will take over the local plant of the Kelly-Springfield Tire Co., which is moving to Cumberland, Md.

## Annual Registration For D. C.

### Tax of \$5 Yearly Instead of Permanent License—Md. Cars Included

WASHINGTON, Feb. 13—The District of Columbia appropriation bill just passed by the Senate, and which is now before the House for action, increases the District's automobile tax as follows:

All automobiles in the future must pay a tax of \$5 annually instead of a permanent license of \$2 as heretofore, on all cars up to 30 hp. and an annual fee of \$10 on all cars over 30 hp.

In addition, cars from Maryland must get annual licenses hereafter unless Maryland repeals its present law under which District car owners are compelled to take out Maryland licenses.

### Record Show for Boston

BOSTON, Feb. 13—All previous records will be broken at the local automobile show, which opens in Mechanics Building and Horticultural Hall on March 3. To date there are eighty-six passenger vehicles and forty-two different makes of trucks. There will be four makes of electric passenger cars and two steam cars, the Stanley and Doble. The Boston show has had applications from 110 passenger car makers, but many of these were unable to secure space because much of it was given to the truck companies.

The Automobile Salon, which opens March 5 in the Copley-Plaza Hotel, is new to New England automobile trade. With few exceptions most of the cars shown in the Salon will also exhibit in Mechanics Building. The Salon will be treated as a separate show entirely, and an admission of \$1 will be charged. Only one admission will be charged for Mechanics Building and Horticultural Hall.

### Newark Show in Palace Ballroom

NEWARK, N. J., Feb. 15—The Newark Automobile Show has been transferred from the First Regiment Armory to the Palace Ballroom. The date, beginning Feb. 24 and continuing for a week, remains the same. The change in place is made because the armory may be needed for military purposes.

### Suit Against Stewart-Warner by Payton

CHICAGO, Feb. 9—The filing of the Stewart-Warner Speedometer Corp. suit alleging infringement of its vacuum fuel feed system patents by the Sparks-Withington Co. and the Heinze Electric Co., as announced last week, has brought to light the fact that a previous suit, in which the Stewart-Warner company was alleged to infringe, was filed March 29, 1916, by

A. L. Payton, a garage owner of this city.

It now develops that the Sparks-Withington Co. has arranged with Mr. Payton to manufacture the Sparton system under a patent license.

Mr. Payton states that he now controls seven patents that have been issued to Seager, Harrington, Noyes Payton, and also five others which are not yet issued. Mr. Payton states that these patents cover both the fuel feed system and the carbureter and it is under these patents that the Sparton system has been manufactured.

It is expected that the case will come up within the next 60 days.

#### Maxwell Buys Another Dayton Factory

DAYTON, OHIO, Feb. 10—The Maxwell Motor Co., Inc., has purchased the plant of the Manufacturers' Production Co., here, and will use it for the manufacture of enclosed bodies. This addition makes three plants in Dayton belonging to the Maxwell company.

#### Porter Body Co. Organized

YPSILANTI, MICH., Feb. 8—The Porter Body Co. has been organized with \$30,000 capital to manufacture automobile parts. It succeeds the Globe Truck Co. in business. Officers include: David Killins, president; G. E. Roiter, vice-president; G. Killins, treasurer, and B. Killins, secretary.

#### All Season Gets Briscoe Order

DETROIT, Feb. 14—The All Season Body Co. has been incorporated for \$500,000 to take over the plant of the Page Bros. Buggy Co., Marshall, Mich., and manufacture automobile bodies. The Briscoe company has placed an order for 5000 bodies with the new company. The officers of the new corporation are: W. L. Page, president; J. A. McAvoy, vice-president; E. E. Page, secretary; W. J. Dibble, treasurer.

## Harroun Rushes Construction

### Machine Shop and Assembly Building To Be Completed Soon—Production in March

WAYNE, MICH., Feb. 9—Within 15 days, the machine shop and assembly building of the Harroun Motors Corp. factory will be practically completed. All of the structural work has now been erected for these two buildings, and the work to be done is of a nature that renders progress quite rapid. This is mainly roof tiling and glazing. The buildings are arranged in the form of a T. The stem of the T is a long saw-tooth building with 105,000 sq. ft. of floor surface. It is 750 ft. long and 140 ft. wide, and intended to be a progressive assembly plant and warehouse.

The top of the T is formed by the machine shop, which is a three-story building, 75 ft. deep by 540 ft. long, having a total floorspace of 405,000 sq. ft. At present, only the first floor of this will be built.

The steel work for the saw-tooth building and machine shop has all been erected, and all the brick work and side wall sash on the saw-tooth building are put in place and ready for glazing. The brick work on the machine shop is now being done, and these two buildings are the ones which will be practically completed in 15 days.

The power house and coal pocket which has a capacity for a full winter's supply of coal, is now ready for the erection of the steel, all the concrete having been poured. It is estimated that the buildings will be ready for the setting of machinery and the receiving of materials for manufacture by March 1.

Up to date, the A. J. Smith Construc-

tion Co., which is doing the work, has been paid \$250,000 for construction, of which \$115,000 is represented in the steel work alone and the balance in concrete, labor, etc. The entire building is in charge of the construction company, which is the same concern that built the latest Paige plant, the original Hudson plant, several of the Maxwell buildings, the Kelsey Wheel factory, and a number of others. The remaining work will cost \$150,000.

Present plans call for the beginning of production shortly after March 1.

#### Sues Ford Motor Co. and Prudden Wheel

DETROIT, Feb. 10—Dr. G. A. Trueman has filed suit against the Ford Motor Co. and the Prudden Wheel Co. for \$100,000. Dr. Trueman experienced an accident which he claims lost him \$100,000 in earnings, and states that the accident resulted when the front wheel of his Ford car broke down. The Ford company states that it exercised all possible care in its selection of the wheel and that the plaintiff did not buy from them. The Prudden company pleads that it owed no duty to the plaintiff since it exercised all reasonable diligence in inspecting the wheel when it was sold to the Ford company.

#### Plan Sale of National Tire & Rubber

EAST PALESTINE, OHIO, Feb. 9—The terms of sale of the National Tire & Rubber Co. have been concluded. The plant and good will are to be transferred to an Ohio corporation now being organized, which expects to capitalize at \$1,000,000.

#### Torbensen Axle Adds 30,000 Sq. Ft.

CLEVELAND, Feb. 10—The Torbensen Axle Co., this city, is adding 30,000 sq. ft. to its plant. The addition comprises two buildings, one at the rear of the



Machine shop and assembly building of Harroun Motors Corp., Wayne, Mich., to be completed this month

main factory, with dimensions of 220 by 100 ft., and the other on the front end, 10 by 80 ft. The additions will be finished in 60 days at a cost of \$150,000.

With these enlargements the Torbensen company expects to double its axle output this year. Last year the plant manufactured 30,000 axles.

The company is introducing a complete new line of front axles for commercial cars, and also 3½ and 5-ton rear axles known as the Torbensen drive.

**Republic Truck Plans Capital Increase**

DETROIT, Feb. 10—The Republic Motor Truck Co., Alma, Mich., will ask its stockholders to approve an increase of capital stock from 62,500 shares of no par value to 100,000, on Feb. 28.

The plant is said to be earning at a rate of \$750,000 annually on its present capital, stock of which is selling at about \$65. Directors propose to issue 15,000 shares of the new stock at \$100 a share to stockholders, though at this time it is not known how the difference between the present selling price and \$100 will be made up.

**Briggs & Stratton Capital \$250,000**

MILWAUKEE, WIS., Feb. 12—The Briggs & Stratton Co., this city, manufacturing ignition systems, electrical specialties, etc., has increased its capital stock from \$50,000 to \$250,000. The company is building a new plant, costing \$100,000, on Hopkins Street, near Teutonia Avenue, which is to be ready for occupancy about April 1.

**Bimel Spoke Increases Capital**

PORTLAND, IND., Feb. 9—The Bimel Spoke & Auto Wheel Co., Portland, Ind., has increased its capital stock by issuing \$50,000 preferred.

**Perfection Coil Spring Increases Capital**

JACKSON, MICH., Feb. 12—The Perfection Coil Spring Co. has increased its capital from \$20,000 to \$100,000.

**Hydraulic Steel  
125% Dividend**

**Stock Distribution To Be Made  
Soon—Making Common  
Stock \$4,500,000**

CLEVELAND, Feb. 9—The Hydraulic Pressed Steel Co. to-day announced that a stock dividend of 125 per cent on the common stock will be made soon. The board of directors proposes to increase the common capitalization from the present \$1,500,000 to \$4,500,000. Of the new stock \$1,875,000 would be used as the stock dividend, \$875,000 would be used in connection with acquisition of the Cleveland Welding & Mfg. Co., which was paid for part with cash out of earnings, and \$250,000 of the stock would remain in the Hydraulic treasury. The company has outstanding \$1,000,000 preferred. The annual meeting was adjourned until March 14 in order to give sufficient time for formal notice of the plans.

**Hall Assets Total \$1,209,778**

DETROIT, Feb. 10—Assets of \$1,209,778 are disclosed in the consolidated balance sheet of the Hall Lamp Co. as of Jan. 1, 1917. This figure is based on the local and Badger Brass plants. Of this amount cash is \$19,819; accounts receivable, \$155,031; inventories, \$472,848; plant, machinery and equipment, \$518,565; real estate, \$40,262; capital stock, \$750,000, and surplus, \$1,209,776.

Accounts payable total \$32,701, while accrued expenses total \$3,291; deferred, \$3,242; patents, good will, contracts, etc., are set at \$1.

**Rubber and Copper Prices Higher**

NEW YORK, Feb. 14—Rubber and copper prices featured last week's market activities with rises. Rubber, on account of the German submarine warfare, rose 4 cents a pound on Para, and 7½ cents on Ceylon. Copper, on account of its scarcity and big demand, has reached 34½ cents a pound, or a gain of ½ cent

for the week. Tin dropped \$2.50 per 100 lb. to \$54.50.

Though tire profits last year were lowered by the rising costs of rubber and other materials, it is stated that several of the companies will not be hampered by the present rise. One of the large companies has enough crude rubber on hand to run its plant at capacity until next July. This rubber was bought far below the present market.

Reports covering the world's total production of crude rubber indicate that the 1916 output amounted to 178,000 tons, of which 114,000 tons, or 64 per cent, were consumed in America. The consumption of rubber in America has more than doubled since 1914. The great rubber plantations of the East now produce about 75 per cent of the total and promise to show a decided increase for 1917. It is expected that this year's crop will amount to 235,000 tons. About 1,412,000 acres are known to be under cultivation.

**Hoover Gross Earnings \$1,310,000**

DETROIT, Feb. 9—The Hoover Steel Ball Co., Ann Arbor, Mich., reports gross earnings for the past year of \$1,310,000. The gross in 1915 was \$493,000, and in 1914 it was \$163,000.

**Motor Products to Issue Notes**

DETROIT, Feb. 10—The Motor Products Corp. proposes to stockholders a plan to issue \$1,000,000 notes, maturing serially every 6 months over a period of 5 years. The note issue will be made to fund the purchase of the plant formerly occupied by the Lozier Motor Co. The plant was bought during the past year, and provided sufficient space for the consolidation of all operations by the local plants of the Motor Products Corp. into a single unit.

In the 8 months ended December the volume of business transacted by the corporation amounted to \$4,072,043, or on a basis of \$6,108,064 per annum. The company now has on its books unfilled orders amounting to \$6,000,000. The earnings for the 8 months were on the basis of about \$11 a share per annum on the outstanding capital stock.

In the 8 months ended December, 1916, the Motor Products Co. transacted business amounting to \$4,072,043, or at the rate of \$6,108,064 per year, \$11 per share on the common stock. Unfilled orders amount to \$6,000,000.

**Dividends Declared**

Maxwell Motors Co., quarterly of 2½ per cent on common; regular dividends on preferred.

Pratt & Whitney Co., quarterly of 1½ per cent on preferred, payable Feb. 20 to stock of record Feb. 8.

Studebaker Corp., quarterly of 2½ per

**Daily Market Reports for the Past Week**

Aluminum, lb.	.58	.58	.58	.58	.58	...
Antimony, lb.	.25	.26	.33	.33	.33	+ .08
Bessemer Steel, ton.	65.00	65.00	65.00	65.00	65.00	...
Copper, Elec, lb.	.34	.34	.34	.34½	.34½	+ .00½
Copper, Lake, lb.	.34	.34	.34	.34½	.34½	+ .00½
Cottonseed Oil, bbl.	12.50	12.55	12.60	12.74	12.74	+ .24
Fish Oil, Menbaden, Brown, gal.	.74	.74	.74	.74	.74	...
Gasoline, Auto, bbl.	.23	.23	.23	.23	.23	...
Lard Oil, prime, gal.	1.40	1.36	1.36	1.36	1.36	-.04
Lead, 100 lb.	9.50	8.30	9.00	9.50	9.50	...
Linseed Oil, gal.	.94	.94	.94	.94	.94	...
Open-Heart Steel, ton.	65.00	65.00	65.00	65.00	65.00	...
Petroleum, bbl., Kans., crude.	3.05	3.05	3.05	3.05	3.05	...
Petroleum, bbl., Pa., crude.	1.70	1.70	1.70	1.70	1.70	...
Rapeseed Oil, refined, gal.	1.00	1.00	1.00	1.00	1.00	...
Rubber, Fine Up-River, Para, lb.	.82	.82	.84	.86	.86	+ .04
Rubber, Ceylon, First Latex, lb.	.85	.87	.89	.89	.92½	+ .07½
Sulphuric Acid, 60 Baume, gal.	1.00	1.00	1.00	1.00	1.00	...
Tin, 100 lb.	57.00	55.00	55.00	54.50	54.50	-2.50
Tire Scrap, lb.	.06½	.06½	.06½	.06½	.06½	...

cent on common and 1 1/4 per cent on preferred, payable March 1 to holders of record Feb. 20.

Torbensen Axle Co., 10 per cent on common, and quarterly of 1 1/4 per cent on preferred.

Linde Air Products Co., quarterly of 1 1/2 per cent on preferred, payable April 2 to holders of March 20, and 2 per cent on common, payable March 21, to holders of March 20. Common holders will be offered additional common stock at par to extent of 30 per cent of holdings as of the close of business March 5, payable one-half on or before March 15, and balance on or before June 15. Common stock increased from \$8,000,000 to \$15,000,000. Retiring directors and officers reelected.

Youngstown Sheet & Tube Co., quarterly of 1 1/4 per cent on preferred, payable April 1 to stock of record March 20, and quarterly of \$2 a share and an extra quarterly of \$3 a share, on common, payable April 1 to stock of record March 20. Proposed 100 per cent stock dividend rejected.

**White Taxed on Market Value**

CLEVELAND, Feb. 9—The market value of a corporation's stock is the proper basis for tax assessment, according to the Ohio State tax commission decision with regard to the White Motor Car Co. The decision followed an objection on the part of the company to having its valuation boosted from \$3,167,000 to \$14,000,000 by county auditor, John A. Zangle. The case, it is reported, will be appealed to the Ohio courts.

**Prices of Securities Lower**

**Trend of Market Downward on Account of Pending Political Action**

NEW YORK, Feb. 13—This week's automobile security prices were governed wholly by the developments of the German submarine policy and the relations between that country and the United States. The trend of the market was downward on account of the holiday, there being very little activity. Prices in general on all the industrials which have shown strength during certain vicissitudes were from a fraction to 15 points lower. On the other hand certain of the automobile and accessory issues showed renewed strength by chalking up substantial gains of from 1 to 27 points.

Fisk second preferred rose to 95 at a gain of 15 points; Maxwell first preferred rose 1 1/2 points to 66 1/4, Stewart-Warner common rose 4 points to 85 1/2, and Studebaker jumped to 107, a rise of 27 points.

Tire issues were on the average lower, with little activity.

**Saginaw Malleable Iron Co. Incorporated**

SAGINAW, MICH., Feb. 10—The Saginaw Malleable Iron Co. has received its incorporation papers. The officers elected were: C. F. Drozeski, president; W. J. Wickes, vice-president; J. Kirby,

secretary, G. H. Hannum, treasurer. Directors include: W. J. Wickes, J. J. Kerns, C. T. Kerry, H. T. Robinson and C. F. Drozeski of this city, and E. J. Lobdell of the American Wood Rim Co. of Onway.

Over-subscription of the stock of the company necessitated an increase in capitalization from \$350,000 to \$400,000. The company now has a capitalization of \$250,000 common stock and \$150,000 preferred stock.

**May List Pierce-Arrow Stock**

NEW YORK, Feb. 9—It is expected that application will soon be made to list the securities of the Pierce-Arrow Motor Car Co. on the New York Stock Exchange. There are 100,000 shares of 8 per cent cumulative preferred stock, par value 100, and 250,000 shares of common without par value.

**Detroit Corporations Are Consolidated**

DETROIT, Feb. 12—The plans for the consolidation of the Detroit Valve & Fittings Co. and the Detroit Brass Works, as reported in a previous issue of THE AUTOMOBILE, were given complete approval by stockholders in a special meeting held Feb. 10. The merger is to be consummated at once.

**Allen Joins Republic Motor Truck**

DETROIT, Feb. 9—Gould Allen has been appointed to the sales staff of the Republic Motor Truck Co., Alma, Mich. He was formerly sales manager of the Colbert Gear Co., Lockport, N. Y.

**Automobile Securities Quotations on the New York and Detroit Exchanges**

	Bid	Asked	Net Ch'ge
Ajax Rubber Co.	69	71	— 1/2
J. I. Case T. M. Co. pfd.	82	85	— 1
Cbalmers Motor Co. com.	25	30	— 5
Chalmers Motor Co. pfd.	..	..	..
*Chandler Motor Car Co.	95 1/2	97	— 3
Chevrolet Motor Co.	95	100	— 3
Fisher Body Corp. com.	35	40	— 2
Fisher Body Corp. pfd.	90	95	— 3
Fisk Rubber Co. com.	60	80	— 15
Fisk Rubber Co. 1st pfd.	101	105	— 3
Fisk Rubber Co. 2nd pfd.	95	102	+ 15
Firestone Tire & Rubber Co. com.	140	144	..
Firestone Tire & Rubber Co. pfd.	108	109	..
*General Motors Co. com.	104 1/2	106	— 2
*General Motors Co. pfd.	88	89	..
*B. F. Goodrich Co. com.	55	55 1/2	+ 1/2
*B. F. Goodrich Co. pfd.	109 1/2	110 1/2	..
Goodyear Tire & Rubber Co. com.	270	275	..
Goodyear Tire & Rubber Co. pfd.	107	108	..
Grant Motor Car Corp.	6	8	..
Hupp Motor Car Corp. com.	4	5	..
Hupp Motor Car Corp. pfd.	..	..	..
International Motor Co. com.	15	19	— 1
International Motor Co. 1st pfd.	..	70	..
International Motor Co. 2nd pfd.	20	30	— 5
*Kelly-Springfield Tire Co. com.	51	53	— 2
*Kelly-Springfield Tire Co. 1st pfd.	88	95	— 2
*Lee Rubber & Tire Corp.	20 1/2	22	— 2
*Maxwell Motor Co. com.	51	52	..
*Maxwell Motor Co. 1st pfd.	66 1/4	66 3/4	+ 1 1/2
*Maxwell Motor Co. 2nd pfd.	34	35	..
Miller Rubber Co. com.	245	253	— 7
Miller Rubber Co. pfd.	105 3/4	106 3/4	..
Packard Motor Car Co. com.	..	154	..
Packard Motor Car Co. pfd.	..	102	..
Paige-Detroit Motor Car Co.	38	39	..
Peerless Truck & Motor Corp.	16	18	..
Portage Rubber Co. com.	162	167	— 4
Portage Rubber Co. pfd.	..	..	..
Regal Motor Car Co. pfd.	27	35	..
Reo Motor Truck Co.	..	..	..
Reo Motor Car Co.	34 1/2	35	..
Saxon Motor Car Corp.	47	48 3/4	— 4
Springfield Body Corp. com.	70	80	..

	Bid	Asked	Net Ch'ge
Springfield Body Corp. pfd.	110	120	..
Standard Motor Construction Co.	5 1/2	6 1/2	+ 1 1/2
Stewart-Warner Speed. Corp. com.	85 1/2	86 1/2	+ 4
*Studebaker Corp. com.	102 1/2	103	..
*Studebaker Corp. pfd.	107	108 1/2	+ 27
Swinehart Tire & Rubber Co.	80	85	..
United Motors Corp.	38 1/2	39	— 1 1/2
*U. S. Rubber Co. com.	52	52 3/4	— 3 1/2
*U. S. Rubber Co. pfd.	106 1/2	107	+ 1 1/2
White Motor Co.	47	48	— 1/2
*Willys-Overland Co. com.	31 1/4	32	— 1 1/2
*Willys-Overland Co. pfd.	94	95	— 1

\*At close Feb. 10, 1917. Listed New York Stock Exchange.

**OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE**

ACTIVE STOCKS			
	Bid	Asked	Net Ch'ge
Auto Body Co.	..	33 1/2	..
Cbalmers Motor Co. com.	..	..	..
Cbalmers Motor Co. pfd.	..	..	..
Continental Motor Co. com.	9 1/4	10 1/4	+ 1 1/2
Continental Motor Co. pfd.	98	99	+ 1 1/2
Ford Motor Co. of Canada.	240	253	..
General Motors Co. com.	..	..	..
General Motors Co. pfd.	..	..	..
Maxwell Motor Co. com.	49	52	..
Maxwell Motor Co. 1st pfd.	..	..	..
Packard Motor Car Co. com.	148	150	..
Packard Motor Car Co. pfd.	..	101 1/2	..
Paige-Detroit Motor Car Co.	37 1/4	39 1/4	..
W. K. Prudden Co.	..	49	..
Reo Motor Car Co.	35 3/4	36 1/4	— 1/2
Studebaker Corp. com.	100 1/2	104	+ 1 1/2
Studebaker Corp. pfd.	..	..	..
C. M. Hall Lamp Co.	..	33	..
INACTIVE STOCKS			
Atlas Drop Forge Co.	..	41	..
Kelsey Wheel Co.	54	59	+ 9
Regal Motor Car Co. pfd.	27	33	..

## Few Closed Cars at Indianapolis

New Quarters Benefit Show—  
City a Shipping Center—  
Bank Clearings Gain

INDIANAPOLIS, Feb. 13—Indianapolis saw forty-five passenger car exhibits, forty-four accessory exhibits, eighteen truck and two tractor exhibits at the show which closed Saturday night. There were seventy-five touring cars, forty-nine roadsters, forty-one closed cars, twenty-seven trucks and two tractors on view.

Indianapolis has unusual trade facilities. It is the center of population of the states and America's largest city not located on navigable water. Coal is cheap, close at hand and abundant. The Indiana coal fields, within a few miles of the city, are fifth in the total quantity mined. Shipping facilities are the best in the country. Indianapolis is the center of a spider web of railroads placing it within easy reach of all parts of Indiana, Michigan, Ohio, Kentucky and Illinois. Seventeen steam carriers and thirteen electric carriers center here, the latter making it the largest interurban center in the world. Close to a rich agricultural district, possessing raw material, power, labor, market and shipping facilities, Indianapolis possesses the five factors of industrial success.

### A Steady Growth

This has resulted in a steady and healthy growth. In 1914 the population was 275,255; in 1915, 282,877; in 1916, 291,940, and it is estimated that 1917 will bring over 300,000. Bank clearings measure a marked increase in the business transacted in the city. The total for last week of \$11,057,886 was approximately 30 per cent more than that of the corresponding week last year. Postal receipts were about \$200 a day larger than at this time a year ago. A marked increase in building permits is noted.

Indiana claims to be the pioneer state in automobile manufacturing, and the second in production to-day. Ten car manufacturers are located in Indianapolis alone—the Cole, National, Pathfinder, Premier, Stutz, Marmon, Empire, Colonial, Hassler and Ford assembly plant. Thirteen other car manufacturers are located elsewhere in the state. The production from Indianapolis for 1916 was 34,762 cars, of which 16,162 were assembled Fords. It is estimated that 60,000 cars will be sent from Indianapolis during the coming year.

Because of the excellent shipping and manufacturing facilities, Indianapolis is a jobbing city. Many nationally-known

accessory and parts manufacturers are located here. Among them are the Prest-O-Lite Co., the Parry Mfg. Co., the Wheeler-Schebler Co., the Hassler Motor Co., Wiedley Motors, the Butler Mfg. Co., and many others.

In 1914 26,500 cars were sold; in 1915, 30,415 cars; in 1916, 43,139 cars, and it is estimated that 60,000 cars will be purchased in the Indiana territory in the coming year.

Indiana has good roads. Of course the business slackens up in the winter, but the problem of Illinois and the mud belt states is missing. A good roads bill is now in the Indiana Senate, proposing that the net proceeds from automobile licenses be turned over to the fund for road construction. This amount is estimated to be from \$700,000 to \$1,000,000, and may be used to build up to 2000 miles of roads each year up to 1920. The action on this bill is doubtful, as it is meeting with some opposition from the counties.

### Champion Motors to Open Chicago Branch

DETROIT, Feb. 9—Champion Motors Co. will open a factory branch in Chicago in the very near future.

### Detroit Team Will Enter Reliability Run

DETROIT, Feb. 12—Directors of Detroit Automobile Club will place a team in the inter-city Reliability Club run at Buffalo in July. The directors of the Detroit Athletic Club will consider the matter at their next meeting. If both clubs send teams, Detroit will be represented by ten cars. The reliability feature will cover 3 days, starting each morning from Buffalo and returning each evening. Chicago, New York, Indianapolis, Cleveland, and Buffalo are scheduled to send teams.

### Safety Rail for Philadelphia Speedway

PHILADELPHIA, Feb. 13—The Philadelphia Motor Speedway Assn. will build a safety rail on the outside of its speedway to prevent runaway racers from plunging off the higher banked curves. At the upper edge of the racing surface will be a rail; beyond the rail is a broad pathway, and at the outer edge of the pathway is another heavy rail surmounted by a screen or fence.

### Friendly Receiver for Crowther

ROCHESTER, N. Y., Feb. 13—Friendly involuntary receivership has been entered by the Crowther Motor Co., this city, manufacturer for the Crowther-Duryea roller-driven chassis for business and passenger purposes. It is said that the concern is solvent, but that it needs \$1,000,000 to do business on a sound basis.

## York Rich Field for Car Sales

City Has 300 Industrial Plants  
—Surrounded by Corn  
and Tobacco Belt

YORK, PA., Feb. 10—With the present industrial boom and prosperity of this great farming community car dealers predict 2500 car sales for the coming year, a business which will net them at least \$2,500,000. Wage-earners low down on the financial scale are now purchasing more cars than ever. However, the majority of these are low-priced cars. Increased wages to employees of industrial plants is given as the cause for this additional business. The estimated population of York county is 150,000 and, taking the number of cars registered, this would show that there is at least one automobile for at least every thirty persons.

York's influence as an industrial center, has been of vast importance to the automobile dealer. More than 300 industrial plants are located here, their products in 1916 amounting to more than \$25,000,000. This is an increase of more than \$4,000,000 for the past 2 years. The capital invested has increased from \$29,328,000 in 1914 to \$33,596,000 in 1916.

Deposits of the forty-two banking institutions of York city and York county showed a gain of \$3,213,850 for the year. The total deposits aggregating \$26,736,427. Business so extensive as to exceed capacity of industrial establishments, profits boosted by war and the resulting wage increases and bonuses are reflected in the bounding profits. These in 1915 were 23,522,577, the largest recorded until that time. The bank clearings last year amounted to \$53,801,514 as compared with \$47,851,799 for 1915, a difference of \$5,949,716.

Crop conditions in general have probably never been better in this county. The corn crop was second in yield in the State and amounted to 4,715,820 bu., the largest ever grown in the county. The average yield was 55 bu. to the acre. The tobacco crop was also the largest ever grown in the county and was estimated at 7,500,000 lb. This has put much money in the farmers' pockets, as the price of tobacco has advanced as high as 20 cents a pound, where heretofore he received from 8 to 12 cents a pound. The production of wheat in this territory was above the general average, the crop yielding a little more than 19 bu. an acre.

### Goodyear Co. Makes Appointments

AKRON, Feb. 13—The Goodyear Tire & Rubber Co. has made several new appointments as follows:

C. W. Martin, Jr., takes charge of the

Southern district, with headquarters at Atlanta, Ga., after serving 5 years as manager of the motor truck tire department. R. S. Wilson, who has been in charge of the service department, has assumed the duties of manager of the motor truck tire department.

G. E. Brunner, who has been assistant to Mr. Wilson in the service department, has been advanced to the position of manager of the department.

W. R. Bliss, formerly manager of the company's Boston branch, is now manager of the New York district. D. M. Colwell, who has been manager of the Southern district, becomes assistant manager of the New York district.

B. S. Waterman, assistant manager of the New England district, assumes the management of the Boston branch, and will continue to look after the company's manufacturers' business in the New England district.

#### Hare Heads New York Dealers

NEW YORK, Feb. 9—Fifty dealers attended the annual meeting and dinner of the Automobile Dealers Assn., Inc., held in the Oak Room of the Hotel Martinique last night. The following directors were elected to serve one year: E. S. Hare, Packard; C. M. Brown, Winton; H. H. Stratton, Dodge; Wm. C. Poertner, National; R. H. Johnston, White; S. DeB. Keim, Locomobile; William Parkinson, Stutz; F. J. Carrie, Marmon; W. T. Savoy, Autocar; John F. Plummer, Liberty.

#### Packard Promotes Citizens Only

DETROIT, Feb. 9—Packard Motor Car Corp. has reissued to its employees a statement of the Americans First policy founded a year ago. This provides for the promotion of citizens only. Foreigners will be welcome at the factory but will be expected to qualify for citizenship eventually.

#### Maxfer Dealers Total 598

CHICAGO, Feb. 10—The Maxfer Truck & Tractor Co., this city, held its first annual banquet of its salesmen and executives during the local show. There was turned in at this banquet \$963,000 from the New York show and \$983,000 from the Chicago show for this year's business.

Dealers have increased 496 since last October, making a total to Feb. 1 of 598

#### Boston Bank in Buenos Aires

BOSTON, Feb. 12—The First National Bank of Boston has established an Argentine branch in Buenos Aires, under the management of Noel F. Tribe, who has resided in that country for 20 years. The branch is intended for the use of American interests in South America and the promotion of Latin-American trade.

## Delaware Boomed By War Profits

### Fruit, Textile and Leather Production Also Contributes to State's Wealth

WILMINGTON, Feb. 10—Naturally a rich State, Delaware is richer than ever this year. With its 200,000 people it is said to contribute more than Maryland or the District of Columbia in income taxes.

Delaware has been wonderfully prosperous for the past 2 years. The Du Pont munition works in Wilmington employ 20,000 persons, pay exceptionally high wages and a big bonus besides. There are also seventeen leather factories in the city which are doing the best business in their history, some being among the largest in the world; there are two shipbuilding industries here, one under Charles M. Schwab's control, turning out steel ships, and steel cars, etc., also some of the largest textile mills in the world, while this city is one of the centres of the fiber industry. Upward of \$100,000,000 in capital is invested in 280 establishments in Wilmington manufacturing 400 lines of goods.

The manufactured products last year were about \$71,000,000. Last year the wages paid aggregated \$20,000,000, \$2,000,000 more than during the preceding year. The bank clearings in Wilmington last year amounted to \$156,985,973.06, as compared with \$107,730,062 during 1915.

The population of Wilmington last year, according to a police census, was 106,374, as compared with 87,411, according to the government census of 1910. Permits for building operations valued at \$2,788,028.06, were issued in Wilmington last year and for 1915 the aggregate was \$1,524,852.05. Last year there were only 58 business failures on the peninsula, with liabilities of \$485,708.33, as compared with 83 failures during the preceding year and liabilities of \$1,178,532.86.

The good fortune has by no means been confined to the city, for, according to the Delaware State Board of Agriculture, the crops raised in the State last year were valued at \$13,101,200, as compared with \$9,157,680 in the year 1915. The volume last year was not quite as great as in the year before, but the prices were better. Delaware's chief agricultural industry now centers largely in berries, fruit, products for canning and market gardening and dairy products. Last year New Castle county, in which Wilmington is located, raised crops valued at \$3,250,000, as compared with \$3,000,000 the year before, according to Prof. Harry Hayward, who is in charge of the agricultural department of Delaware College. Surveys made during the year by the

college, in co-operation with the federal government, showed that in New Castle county the money invested in agriculture earned from 5 to 9 per cent, according to crops and conditions; in Kent and Sussex counties, Delaware, 7 to 9 per cent in the heavy berry sections, with a general average in those two counties of 5 to 6 per cent; the average on the whole peninsula being estimated at 6 per cent. Incidentally, the number of farmers who have bought motor cars was greater last year than ever before. While many are buying cars for pleasure, a large number find them a convenience and economical in their business. This trade is capable of large development. The farmer, however, is not the only new customer for the motor car dealer, for many of the small merchants and even some mechanics in the city are now owning cars.

Last year approximately 2500 were sold in Delaware, the registration, 7102, showing an increase of 2445 over the preceding year. This year's sales are expected to be somewhere between 3500 and 4000. In Delaware there are 412 dealers, about 350 garages and 275 repair shops.

#### Automobile Mechanics Corp. Buys Two Companies

NEW YORK, Feb. 12—The Automobile Mechanics Corp. has bought the Abbott-Detroit Parts Corp. and the Marion Auto Service Co. It has also acquired the Elcar service for the eastern part of the United States and a large stock of Pullman parts for the Pullman service. The company, which does extensive repair work, has taken new quarters at 221 West Fifty-third Street, New York.

#### Sales Agents for Hayes Wheels

DETROIT, Feb. 12—F. E. Castle and H. W. Kyte have completed a transaction with the Hayes Wheel Co., Jackson, Mich., to become the general sales agents for wire wheels which this company will begin to manufacture. Mr. Kyte was formerly the manager of the Houk Manufacturing Co., and Mr. Castle has been connected with the automobile accessory industry for the past 16 years.

#### Harroun Signs Up Distributors

DETROIT, Feb. 12—Harroun Motors Co. has signed up a number of big distributors in the past few weeks. Among these are: Mark-Roberts Motor Co., Seattle, Portland and Spokane; Lord Motor Car Co., Lincoln, Neb.; Southern Motors Corp., El Paso; Buxton-Phillips Motor Car Corp., Kansas City; Wetmore & Quinn, Detroit, and others.

#### Chalmers Has \$8,000,000 Material

DETROIT, Feb. 12—The Chalmers Motor Co. has \$8,000,000 worth of material on hand.





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## The Aero Show

IT is not easy to reckon up the value of an exhibition like the aero show, because at present there are but few customers. The exhibition held this week in New York is composed of aeroplane builders and people who supply aeroplane builders with the things they need, but it is a much more important event than a mere get-together of the members of the youngest industry.

It is essential for a new industry to attract attention. It has got to popularize itself; it has got to stimulate public imagination. Every industry depends for its success upon the men who are in it. It requires brains of all kinds and it is best served when it secures those brains young and vigorous. We do not know what will be the ultimate volume of aeroplane manufacture; we do not know how it will rank as an industry in the years to come, but we do know, and this it is certain, that it will be much larger and vastly more important than it is to-day. Although its main usefulness has so far been in war, the aeroplane is something far more than a weapon, and its commercial value will develop from its military value.

The aero show stimulated thought among thousands of people who previously had never even seen a flying machine. There have been no great crowds, but the attendance has been good and the really deep interest of the most careless amongst the sight-seers was very noticeable.

## Elevated Automobile Streets

CITIES such as New York, Chicago, Boston, and a few others will soon be face to face with the necessity of taking radical measures to relieve vehicular congestion. Already subways for automobiles have been suggested, the *New York Times* advocating such a system. THE AUTOMOBILE for several months has favored an elevated automobile road in New York for passenger car traffic. Such a roadway would extend from the lower end of the city north to Central Park, or perhaps further. With such an elevated system speeds of 40 m.p.h. would be permissible and the business man with offices on Wall Street or in the financial section would reach his office quicker than he can to-day on the subway.

That there is prime necessity for such an elevated automobile road is evidenced by the congested traffic. It is so bad that automobile traffic in many business sections is as slow as walking. The greater usefulness of the automobile is being seriously hampered, and relief can only come through such an elevated system. With the elevated automobile road there would be provision to get onto it at every third or fourth street. The roadway would be divided for two-way traffic and would be controlled by a special traffic force.

## Parting From Gravity

FOR us to get rid of the habit of estimating the quality of gasoline by means of its specific gravity or Baumé will be hard. It will take a long time before even the trade ceases to trust in it and still longer before motorists realize its uselessness. Moreover, there is nothing simpler to replace it.

Probably we shall come ultimately to thinking of the starting and end points of the distillation curves, because these two temperatures do give some idea of what the gasoline is, but it is to be hoped that some simpler way of naming these figures may be devised. The starting point, the temperature at which the lightest fraction in the gasoline begins to boil, shows roughly how easy it will be to start on the fuel, and the end point, or the temperature as the last few drops of the heaviest constituent evaporate, shows roughly how easy it is to burn the fuel completely without leaving gummy or carbon deposits in the cylinders. Unfortunately these two figures do not tell the thermal value of the fuel, which is its ability to produce power.

In a rough way the lower the starting point and the lower the end point the "cleaner" is the gasoline. European buyers till quite recently refused to take any gasoline with an end point higher than 300 deg. Fahr.; but many engineers now consider that this sort of gas, while clean enough, is not as good a fuel as one with a 400-deg. end point, and they are not prepared to say that one with a 450 end point will not burn just as well in a modern engine. These things have got to be cleared up, but in reaching a conclusion the need for a simple way of naming the quality determining factors must not be overlooked.

# MANUFACTURERS' Manufacturer to Distributor, Dealer, Buyer

# MERCHANDISING

*Second Article of  
The Automobile's  
New Department*

## \$50,000,000 To Be Spent on Aeroplanes Should Tempt Automobile Parts Makers To Get Busy in New Field

**T**HE most successful men and firms in any business are those who saw an opportunity just a little before the rest and were not afraid to trust their own judgment. This is not perhaps so true of the men with revolutionary ideas, but it is invariably true of those who supply the revolutionaries with what they need.

The most successful firms in the automobile business are not the original builders of cars, but a study of the firms supplying the car builders shows that the early birds did most certainly secure the worms. Are we not going to see a repetition of this situation with respect to aircraft manufacture?

### *Needs of Aviation Industry*

The *design* of an aeroplane is an entirely special business. It is not a thing to be embarked upon by any automobile manufacturer unless as a separate venture entirely unconnected with his existing business, but this is no reason why firms equipped for the supply of parts to automobile manufacturers should not add to their production articles which go to the construction of an aeroplane.

In the case of engines, the automobile industry is already firmly established, since if many of the complete motors are made by concerns having no automobile connection, still the valves, valve springs, castings, forgings, spark plugs, carbureters, etc., all come from automobile sources. These things differ but very little from what is required in the making of automobiles, but they do differ. So, when one turns to parts of planes themselves, it is a little surprising to find so many strange names among the makers of the innumerable small fittings which are a part of every machine.

### *Field for Stampings*

To cite just a single example, in every aeroplane there are a great many parts made from sheet metal. Usually these are cut out by hand and formed by hand, each aeroplane manufacturer producing his own. They could be made on a production scale by stamping, not only far more economically but far better, yet how many of the automobile stamping firms are making any real effort to get the aeroplane builders' business?

Following this item just a stage further, it may be argued that the total quantity required is in any case small; that the permanency of the aeroplane business is still debatable; that there is so great a demand from the automobile manufacturers that it is not

worth while considering new and troublesome business. It is difficult to believe that any of these arguments are really sound.

The manufacturer or builder of aeroplanes is not for long going to be content to do unnecessary work for himself. The making of the necessary woodwork, assembling, covering the wings, etc., is quite sufficient a business in itself. It needs a class of labor totally distinct from that required for the manufacture of metal fittings. The former is the essential feature of aeroplane making, the latter is the non-essential feature.

With respect to the bolts used in aeroplane building, the wire strainers, and similar automatic machine tool produced parts, standardization permitting economical quantity manufacture is coming rapidly. There is no reason why a certain amount of standardization in sheet metal parts is not followed, but both forms of standardizing will come much quicker if aided by the powerful influence which well-established manufacturers of such specialties can bring to bear. At present, when the aeroplane builder has come to the automobile supply house he has usually been welcome.

### *Magneto Industry Active*

Take the case of the magneto industry, and we see this entirely in the hands of firms famous in the automobile world. The Splitdorf Co., for example, has had an engineer who for the past year or more has spent the whole of his time following up the Splitdorf magnetos in air service, tracking down any failure, discovering any shortcoming, investigating all possibilities for future improvement. No doubt the same is true also of other magneto concerns as it is true of the leading spark-plug makers and of the most up-to-date carbureter manufacturers.

On the other hand, the case of the radiators is different; the radiator is as essential a part of a water-cooled power plant as the magneto; being merely dead weight its efficiency is of high importance. Upon it falls the task of removing the heat as rapidly as possible with as little water as possible. Nobody is better equipped for supplying the aeroplane with the radiators it needs than the automobile radiator manufacturers. Yet it is obvious they have not taken a grip, and if ultimately they want to hold their proper place every week's delay is going to increase the difficulty of getting that grip.

Aeroplanes are going to carry a good deal of electrical equipment. Their engines obviously will be



Examples  
of  
Aero Show  
Exhibits

McCord is prepared to make aeroplane radiators and Goodyear already has a large business with fabrics for aircraft



There is no plane without some aluminum castings and Stromberg is paying close attention to aviation engine carburetion



A booth was devoted to display of S. A. E. standards and the adjoining one to samples of testing work by the Bureau of Standards

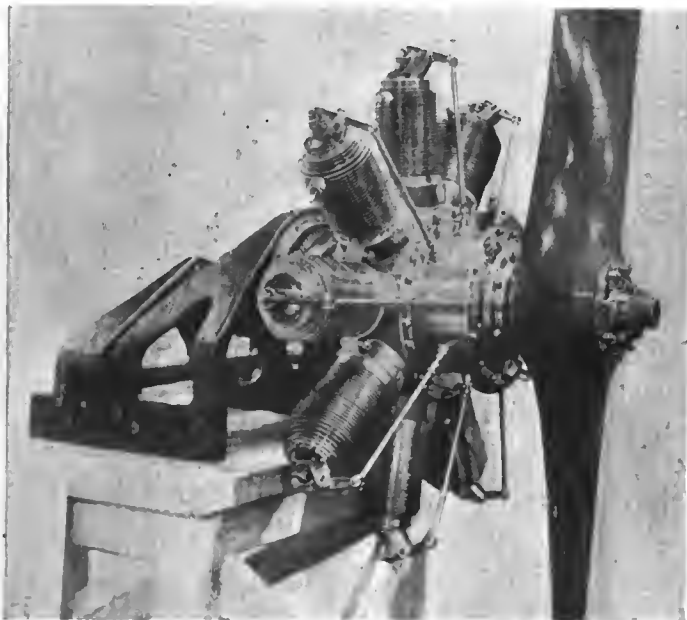
started electrically. Electricity will probably be used in some way in connection with controls. It is needed on military machines for radio apparatus. For the manufacture of compact light-weight electrical fittings, no one can compete with the automobile specialists, if they will only take the trouble to bring their experience to bear upon the very few additional problems which appear in designing for aircraft, and just a few have realized this. It is a field that will pay in the future.

#### Missing Opportunity

The First National Aero Exhibition in New York shows that the automobile parts manufacturers have not yet realized the opportunities in the new field. Only a few of them are ready to go ahead after some of the \$50,000,000 which the United States Government will spend on aircraft this year, to say nothing

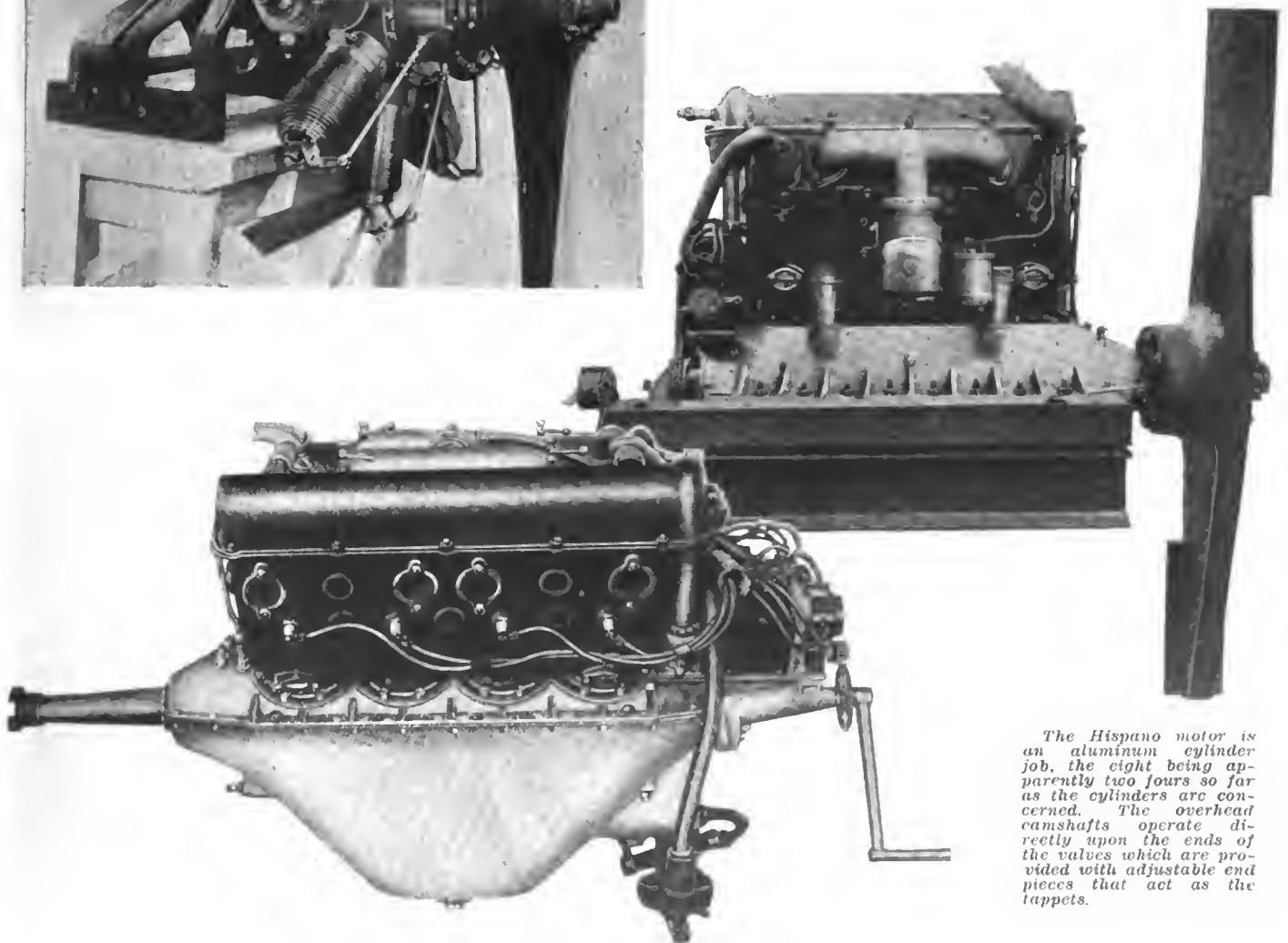
of the large sums which foreign governments are spending in this country.

The aeroplane builder who wants something made for him has now got to seek out somebody to make it. He is not yet receiving many inquiries from parts manufacturers asking what they could make for him. To wait for the customer to come to you is a common fault with large firms, more especially when the new customer looks pretty small. The export trade of the United States has lost incredible sums of money through its apathy with respect to the South American markets. The reason was no doubt that nobody felt very sure what sort of a fellow the South American buyer really was. Our more progressive firms have got busy and found out, and it is high time that our automobile parts specialists got busy and found out about the consuming power of the aeroplane industry.

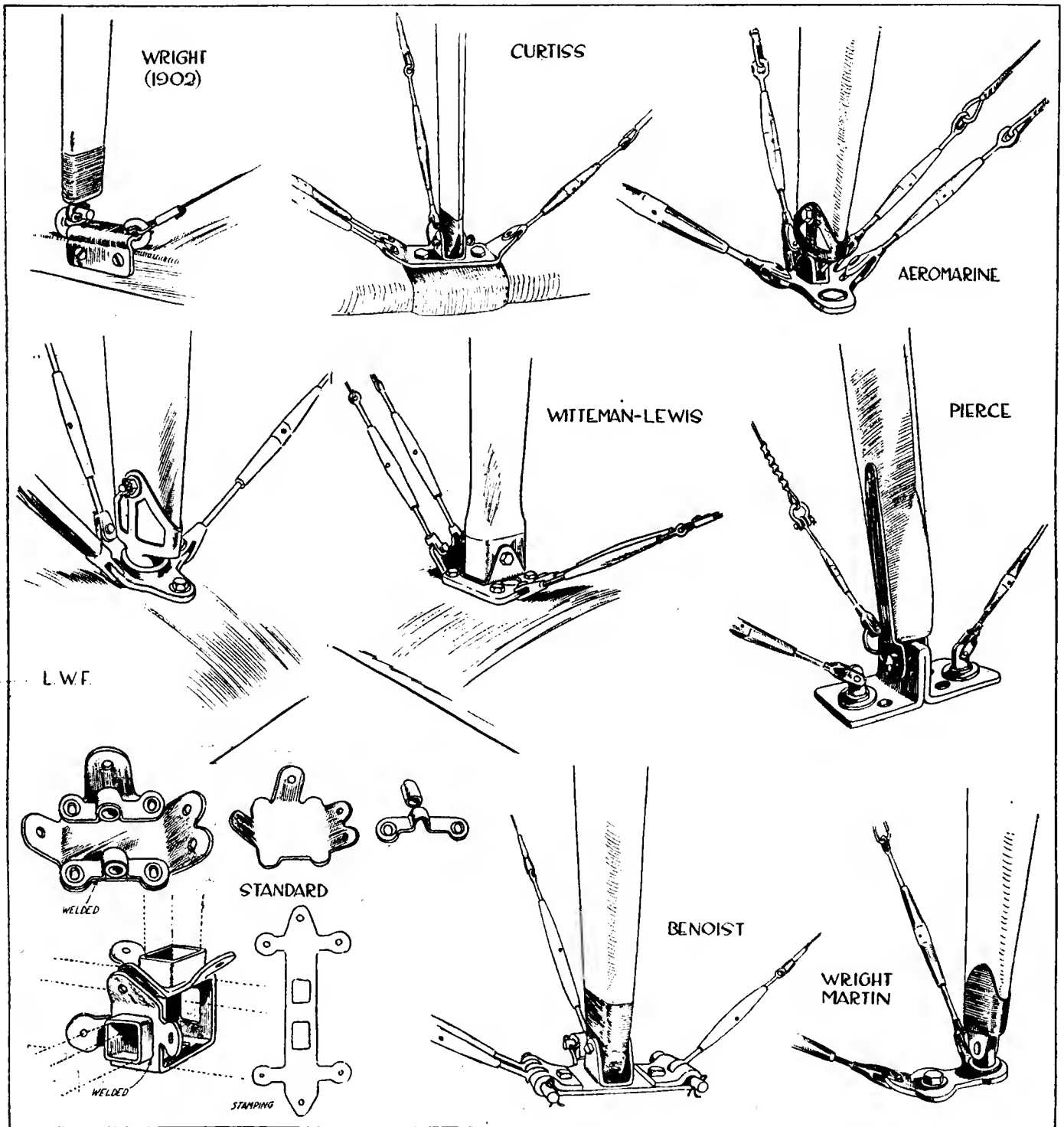


## Two Famous Engines

**T**HE Gnome rotating engine exhibited by the General Vehicle Co. at the aero show, and the four and six cylinder Hispano-Suiza engines in the Wright-Martin booth are both being made for foreign governments and the details regarding them which are at present available are somewhat meager. The Gnome seems to be precisely the same as it was several years ago, the cylinders still being turned from the solid billet and the crankcase made from two drop forgings.

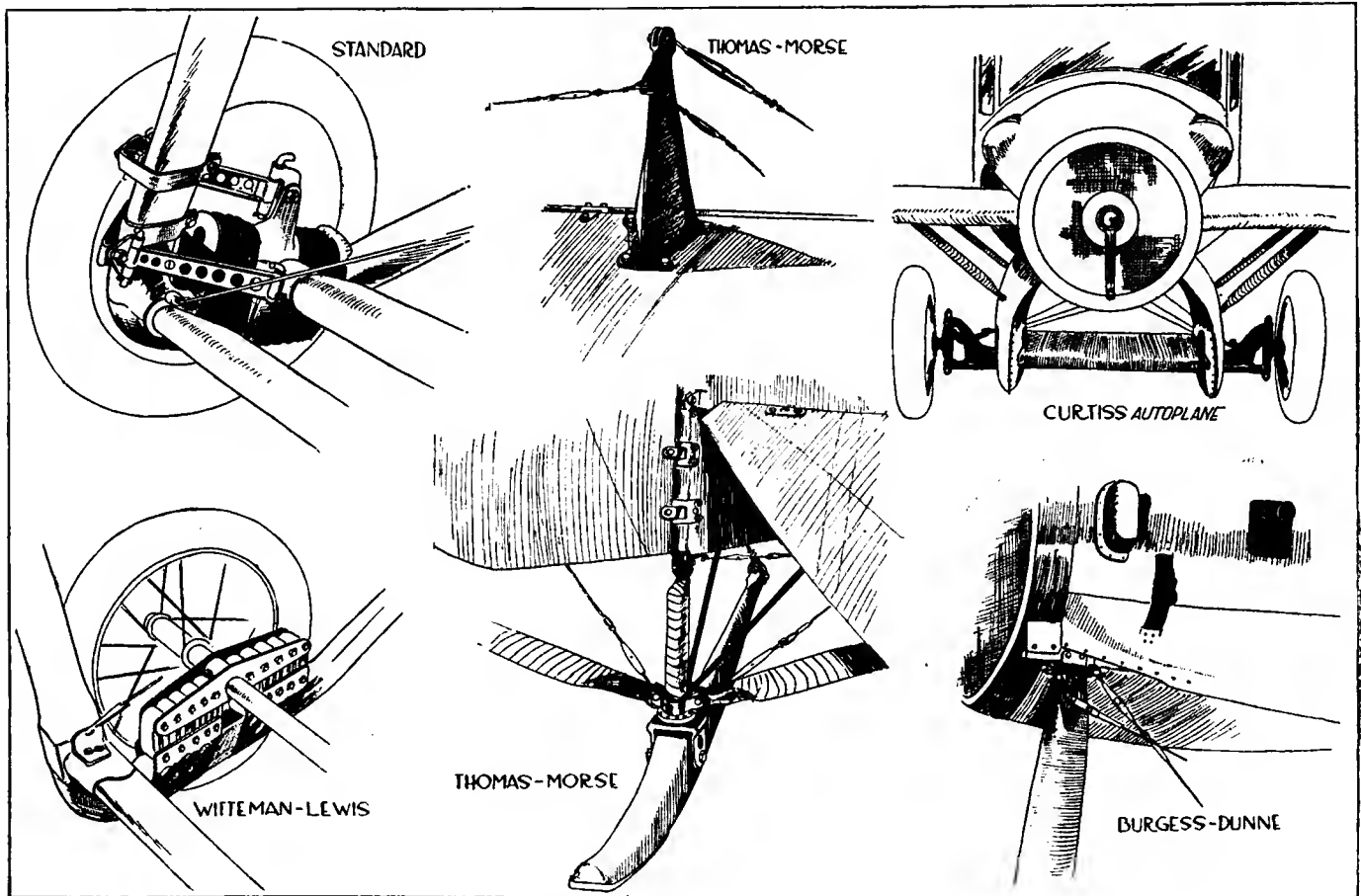


The Hispano motor is an aluminum cylinder job, the eight being apparently two fours so far as the cylinders are concerned. The overhead camshafts operate directly upon the ends of the valves which are provided with adjustable end pieces that act as the tappets.



## Aeroplane Show Statistics and Details

Engine	Hp.	B. & S.	R.P.M.	Cylinders	Number Carbureters	Number Magnetos	Valves	Propeller Speed	Material of Pistons
Duesenberg . . . . .	400	4 1/8 x 7	2100	12 V	2	2	Horizontal	Direct	Aluminum alloy
Duesenberg . . . . .	70	4 3/8 x 7	1500	4 vertical	1	1	16	Direct	Aluminum alloy
Paekard . . . . .	225	4 x 6	2180	12 V	2	1	I-head	1250	Aluminum alloy
Trebert . . . . .	150	4 x 4	1500	16 revolving	1	2	F-head	Direct	Magnalite
Frederickson . . . . .	70	4 1/2 x 4 3/4	1000	5 revolving	1	1	Two-cycle	Direct	Cast iron
Wisconsin . . . . .	150	5 x 6 1/2	1500	6 vertical	1	2	I-head	Direct	Aluminum alloy
Wisconsin . . . . .	300	5 x 6 1/2	1500	12 V	4	2	I-head	Direct	Aluminum alloy
Gnome . . . . .	100	4 x 6	1200	9 revolving	1	1	I-head	Direct	Steel
Knox . . . . .	300	4 3/4 x 7	1800	12 V	2	1	I-head	1080	Aluminum alloy
Anzain . . . . .	220	4 x 5	1200	20 circular	2	2	I-head	Direct	.....
Roberts . . . . .	105	5 x 5 1/2	1300	6 vertical	2	2	.....	Direct	Cast iron
Thomas-Morse . . . . .	135	4 x 5 1/2	1200	8 V	1	2	L-Head	Direct	.....



Engine	Hp.	B. & S.	R.P.M.	Cylinders	Number Carbureters	Number Magnetos	Valves	Propeller Speed	Material in Pistons
Aeromarine.....	100	3½x5½	2300	8 V	1	.....	I-head	1150	Aluminum
Curtiss.....	90	4 x4	1400	8 V	1	1	I-head	.....	Aluminum
Curtiss.....	100	4¼x5	1400	8 V	1	2	I-head	.....	Aluminum
Curtiss.....	200	5 x7	1400	9 V	2	2	I-head	.....	Aluminum
Curtiss.....	300	5 x7	1400	12 V	2	2	I-head	.....	Aluminum
Wright-Martin..	150	4.72x5.1	1450	8 V	1	2	I-head	Direct	.....
Wright-Martin..	75	.....	.....	4 vertical	1	2	I-head	.....	.....
Hall-Scott.....	150	.....	1375	6 vertical	.....	.....	I-head	Direct	.....
Sturtevant.....	140	4 x5½	2000	8 V	1	1	I-head	Direct	Aluminum
Pierce.....	35	4 x6	.....	3 radial	.....	.....	I-head	.....	Aluminum

Plane	Type	Wing Span		Chord	Gap	Carrying Capacity	Lifting Capacity	Propeller	Control	Price	Motor	Miscellaneous
		Upper	Lower									
Benoist.....	Bi-flying boat	46'	46'	5'	6'	2200	550	1 pusher	Dep.	\$6,500	Roberts 100 hp. in planes	2 radiators, 1 each side of motor
Thomas-Morse	Military tractor biplane	52'9"	34'	5'3"	5'	2150	700	1 tractor	Dep.	....	135 hp.	.....
Cooper.....	Bi-flying boat	33'	22'	...	4'6"	...	...	1 pusher	..	4,000	70 hp.	Flexible wings Flexible control surface
Aeromarine....	Biplane.....	41'	31'	...	..	1900	700	1 tractor	Dep.	9,000	100 hp.	.....
Curtiss.....	Military tractor	43'6"	34'	5'	5'2"	1890	485	1 tractor	Dep.	....	90 hp.	.....
Curtiss.....	Bi-flying boat	45'2"	35'2"	5'2"	5'11"	2100	660	1 pusher	Dep.	....	100 hp.	.....
Curtiss.....	Triplane boat	40'	40'	...	...	2450	1450	.....	.....	....	100 hp.	.....
Burgess-Dunne	Bi-seaplane..	46'	46'	5'	5'3"	2400	900	1 tractor	Dep.	....	Roberts 100 hp.	.....
Wright-Martin.	Bi-military tractor	29'	29'	5'8"	5'9½"	1725	915	1 tractor	Dep.	....	150 hp.	.....
Wright-Martin.	Bi-tractor...	50'7"	50'7"	...	..	1905	983	1 tractor	Dep.	....	Hispano-Suiza 150 hp. Hall-Scott	Detachable nose Double radiator over motor
Pierce.....	Biplane.....	26'	20'	...	...	880	250	1 tractor	Dep.	3,000	35 hp.	.....
Witte-man.....	Bi-military tractor	42'	42'	5'6"	5'6"	1375	600	1 tractor	Dep.	....	90 hp. Hall-Scott	.....

# 90,000 Cars for Northwest in 1917

Minneapolis, Distributing Center of Great Agricultural Territory, Doubles Show Over 1916—216,936 Farmer Prospects—Crops in Four States Worth \$555,572,000

**M**INNEAPOLIS, Feb. 10—Sales of 90,000 cars in the great dairy and agricultural territory served by Minneapolis are predicted for 1917 by branch managers and dealers at the annual show. This is an increase of 10,000 over sales in 1916, and, moreover, there are 216,936 farmers in this territory who are prospective car owners. Industrial and financial conditions are more propitious than at any time in the history of the section and the crops of the coming year, the index to car sales, are expected to prove very heavy and enormously profitable.

### Show Doubled in Size

The Minneapolis show, looked upon as one of the most important in the country from a sales standpoint, is greatly improved over last year and practically doubled in size. A snowfall of almost unprecedented severity, the heaviest in 40 years, kept thousands of enthusiastic car owners and dealers away from the opening, many towns not having seen a train for 2 weeks, but later a good representation of the 3,000,000 or more population of the territory forced their way to this city, sometimes by dynamiting 15-ft. snowbanks to enable traffic to pass.

Previously Minneapolis shows have been held in the Armory, but this building was found to be too small, and arrangements were made this year to use the Mazda Lamp factory building, recently completed but not put into use on account of a lack of machinery. This building has 119,000 sq. ft. of floor space, whereas the Armory had but 65,000. Three floors and the basement were occupied this year by the show and the exhibits numbered 238 as against 148 a year ago. Exhibitors of passenger cars increased from forty-eight last year to seventy-two this year, and the number of machines exhibited this year is 300, compared with 203 in 1916. Accessory exhibitors to the number of seventy-four displayed their wares this year, compared with forty-eight last year. Thirty-six commercial car exhibits are made this year as against seven in 1916, and there are eight tractor exhibits this year, where there was none a year ago. In connection with the show Minneapolis-made products, ranging from beds to engines, were shown in a room adjoining the

Northwest Statistics	
<b>Farmers' Yearly Receipts</b>	
Grain .....	\$555,572,000
Butter .....	40,000,000
Butter Fat .....	30,000,000
Live Stock .....	30,000,000
Poultry .....	30,000,000
<b>Car Sales Factors</b>	
Farmer Prospects .....	216,936
Estimated 1917 Sales..	90,000
1916 Car Sales .....	80,000

show, occupying 13,600 sq. ft. of floor space.

Comparing the Minneapolis show with those of New York and Chicago, it is found to be only slightly smaller when the number of exhibits are considered, and one has only to study the vast distributing territory into which the Twin Cities distribute automobiles to find the reason for a show of such proportions.

### Territory's Wealth Enormous

Without being specific as to the richness of the states tributary to Minneapolis, the extent of which is difficult to grasp unless one drives over the prairie, the crop reports give a fairly good idea of the buying possibilities found in the rural residents of this vast territory of the Northwest. Among the leading industries of the Minneapolis trade territory are farming, dairying, wool-growing, live-stock raising, manufacturing and iron mining. Every one of these is active. Wages paid laboring men have advanced materially since a year ago, particularly in mining and manufacturing. Estimates of wages paid in the Butte and Anaconda districts of Montana, alone, are placed at \$3,500,000 a month, and all of this money is put into circulation, due to the high prices of living necessities.

The wealth of the Great Northwest this year, while perhaps not as great as last year, is staggering. Creameries pay farmers about \$30,000,000 a year for butter fat, while butter adds \$40,000,000 more. Receipts for live stock give

farmers approximately \$30,000,000 a year and the poultry division was estimated to pay \$30,000,000 a year also. Estimates give the combined dairy and live stock receipts of Minnesota and the Dakotas as \$200,000,000 a year and estimates of cash available from all sources last year put the figure at \$684,000,000, to which might be added the estimate by the Montana agriculture commissioner of \$94,936,000 as the crop value of 1916 for that state. In these four principal states the total crop of wheat, corn, oats, barley, rye and flax last year amounted to 963,561,000 bu. by government estimate valued at \$555,572,000.

Figures for the fiscal year ended Dec. 31, 1916, and showing comparison between 1915 and 1916 crops in Minnesota follow:

	1916 Bushels	1915 Bushels
Wheat .....	170,208,650	169,981,320
Corn .....	5,733,680	14,880,260
Oats .....	49,467,830	21,924,230
Barley .....	45,852,130	28,538,400
Rye .....	6,890,650	5,210,190
Flaxseed .....	7,461,210	7,199,150
Flour shipped ....	21,300,994 Barrels	..... Barrels

Receipts of wheat in Minneapolis are approximately 11,000,000 bu. less for 1916 than 1915 and the total receipts of all grains were 1,000,000 bu. less the year of 1916 than its predecessor. The following table gives the receipts of grain in Minneapolis market as shown by the Chamber of Commerce report:

	1916 Bushels	1915 Bushels
Wheat .....	131,947,520	142,669,370
Corn .....	7,137,260	10,777,330
Oats .....	42,535,710	33,544,650
Barley .....	37,271,590	36,593,780
Rye .....	7,202,030	6,236,660
Flaxseed .....	8,797,460	6,148,970
Total .....	234,891,570 Barrels	235,970,760 Barrels
Flour .....	900,648	756,688

The financial condition of this great territory is reflected in the bank reports, and dealers from the various districts of this territory report that the small country banks are bulging with money which the farmers have received for their 1916 crops. Thus the field for the sale of 1917 cars in the territory fed by factory branches and distributing agencies in Minneapolis is especially good. What is more, the people are able to pay for the cars they buy, whereas in previous years it has largely been the policy of farmers to buy cars on time, which neces-

sitated the dealers converting their notes into money at the bank. It is not so long ago that some of the smaller farmers found themselves unable to pay even interest and taxes on their property, but the banner crop years of 1914, 1915 and 1916 have enabled them not only to pay off all taxes and interest charges but to pay for the land as well and leave them a comfortable bank balance.

**\$1,800 Farmer's Average**

While averages may not be taken as the criterion of what every farmer in this territory earned last year, they offer an interesting study. The census shows approximately 430,000 farmers in the territory handled in Minneapolis, with an approximate total gross income for last year of \$779,000,000, which would give each an average income of slightly over \$1,800. One-half of these farmers now own cars and the other half are prospects this year.

Farms in the Northwest cannot be compared with the farms of Illinois, Indiana and Ohio. The Northwest is a territory of great distances and the automobile is a dominant factor in diminishing distance. It has removed barriers hitherto considered insurmountable and proved a worth-while factor in educational, social and commercial progress.

With the farmers in a position to buy, dealers and distributors have planned a very active campaign for the early spring. The latest car census goes to show that in this particular territory there are at least 216,936 farmers who have not yet become car owners. Conservative estimates made by branch managers and dealers put the number of cars to be sold in this territory in 1917 at 90,000, which is an increase of 10,000 over the number sold last year. The average cost of these 90,000 cars is variously estimated at from \$765 to \$900 each. The first figure would give the valuation of \$70,000,000 in business for the year, while a more liberal estimate would give \$84,000,000. When one is in Minneapolis, making a survey of business conditions, one must think in terms of the soil. Here money and crops are synonymous. Bankers as a unit say that the territory is in a prosperous condition, and, although the crop as a whole did not come up to the figures for the bumper harvest of 1915, the average price is higher, which nearly made up the difference. Money is easy and collections are good.

Looking to the future—specifically 1917 crops—the heavy snows in January and February presage a harvest second to none in the great Northwest since the automobile became a reality. Not in 40 years has there been such a snow in January close to the Twin City, and if this blanket disappears gradually in the spring the great snow overflow of the

Northwest will filter into the soil, creating a deep moisture and causing grain to stull deep as preparedness against possibly dry weather before harvest time.

Before making an analysis of what the 1916 crop or the one to come may mean in the sale of cars, perhaps we can get a better conception of their meaning by considering what crops have already done in the way of increasing cars in the state of Minnesota. It was estimated by J. A. Schmall, secretary of state, that by the end of 1917 car registrations in Minnesota will be 200,000. To-day his books show slightly over 138,000 cars in that state, a figure which he prophesied a year ago. Half a decade ago there were only 17,960 cars in Min-

Year	Cars	Year	Cars
1909	7,000	1914	68,500
1910	12,500	1915	94,000
1911	19,000	1916	138,000
1912	28,400	1917 (est.)	200,000
1913	45,800		

Analyzing the 138,000 cars now owned in Minnesota, we find 50,807 are owned in towns of more than 1000 population. In fact this is a greater number than is owned in towns of any other population. The percentage of increase of the number of cars now owned in towns of under 1000 population compared with a year ago is 38.8. These figures indicate that the majority, in fact nearly all, of the cars go direct to farmers. The relative number of cars owned in small towns and in the three larger cities—Minneapolis, St. Paul and Duluth—serves to prove the farmer's case even further. Registration figures of cars owned in these three cities total 30,096 in 1916, which, subtracted from the total registration of 138,000, gives 108,000 owned by farmers and people in towns outside of these three large cities. Outside of these three cities, there are no others in the state in excess of 20,000 population, and in the towns with populations ranging from 10,000 to 20,000 cars only 3277 cars were owned last year. In the class of 9000 to 10,000, the number of cars last year totaled 1154, while those in towns from 2000 to 9000 totaled approximately 15,000 cars. This would leave approximately 90,000 cars owned in towns under 2000 and in the country districts.

**High Car-Population Ratio**

The Northwest is buying cars faster in ratio to its population than any other district in the country and it is not unusual to find people close in touch with the industry saying that within the next 10 years there will be a car for every ten or twelve people throughout the territory. It must not be thought that Minnesota farmers or in fact farmers of the entire territory that gets its cars from Minneapolis is near the saturation point in car buying. While it is admitted that approximately 50 per cent of farmers in Minnesota, the Dakotas, eastern Montana, northern Iowa and western Wisconsin—the territory embraced in the Minneapolis district—own cars, the other 50 per cent will be buying cars within comparatively a short time, and to-day there is a definite field for the sale of approximately 216,000 new cars in this district, say nothing of the re-orders from present car owners.

The foregoing figures tend to show that farmers are buying cars selling for more than \$1,000 and information gained from dealers and distributors in general at the Minneapolis show was to the effect that the farmers in the Northwest show a greater tendency from year to year to buy cars of the more expensive type, especially those listing above \$1,000.

The Twin Cities made good in the po-

**Minnesota Registration by Makes**

Name	Compiled by <i>The Farmer</i>			
	1913	1914	1915	1916
Abbott	19	158	154	176
Apperson	75	95	109	155
Auburn	108	117	109	153
Briscoe	...	10	64	115
Buick	3,710	5,781	6,686	8,716
Cadillac	1,292	1,577	1,597	1,924
Chalmers	618	783	826	1,122
Chandler	...	...	120	234
Chevrolet	6	464	1,284	2,440
Empire	39	149	279	341
Enger	8	6	10	12
Fiat	2	17	25	27
Ford	10,321	19,339	30,708	44,471
Franklin	291	351	854	455
Haynes	93	118	172	236
Hudson	531	722	917	1,219
Hupmobile	544	792	893	1,212
Interstate	90	249	156	217
Jeffery	15	166	440	574
Kissel	457	560	718	873
Locomobile	35	97	116	132
Lozler	56	63	79	90
Marmon	88	95	88	101
Maxwell	1,552	2,260	3,551	4,974
Mercer	8	12	17	23
Metz	287	401	516	654
Mitchell	858	998	983	1,234
Moline	81	104	86	111
Moon	26	22	76	111
National	17	50	71	104
Oakland	430	629	1,075	1,555
Oldsmobile	386	446	505	654
Overland	3,183	4,973	7,518	11,802
Packard	547	645	653	817
Paige	197	403	613	815
Pathfinder	8	26	47	64
Peerless	163	284	267	301
Pierce-Arrow	216	256	240	282
Premier	49	74	61	65
Simplex	5	6	4	8
Stearns	61	59	71	94
Studebaker	1,760	3,001	5,637	7,437
Stutz	5	7	28	36
Vette	465	590	637	778
White	262	282	265	317
Winton	197	231	248	300

nesota. Two years ago there was but 68,500 machines, this number being increased 46,000 last year.

Ford leads in the number of cars now owned in that territory, while Overland is second and still ahead of its nearest competitor, Buick—these two have run a neck-and-neck race a number of years.

License tags in Minnesota are sold for 3 years for \$1.50. The last triennium began in 1915. For the first two years the returns of the state were \$241,000, as compared with \$144,531 for the entire preceding 3-year period. Beginning next year, license tags will cost \$5 for 3 years. This will be pro-rated after Jan. 1, 1919, at \$3.50, and \$2 for 1920. Registrations by years are:



sition they took last year—that of being the biggest distributing territory in the country for many makers of cars. More than ever are manufacturers realizing the importance of this territory. Carload receipts of motor vehicles into Minneapolis last year showed a gain of 25 per cent over 1915, the figures for the two years being 5804 and 4835 respectively, while shipments of complete cars outshowered an even greater gain, the number of carloads shipped out of Minneapolis in 1916 being 6930, as against 3837 in 1915.

A census of Minneapolis, showing the origin of much of the automobile and accessory business in the Northwest, places dealers in automobiles at eighty-four; dealers in trucks, twenty-six; dealers in electrics only, five; dealers in accessories, 165; manufacturers of trucks, seven; assembling plants, two; makers of parts and appliances, six; garages, seventy-one, and garages for electrics only, three.

As an indication of what some makers think of this territory as a field of endeavor, the production program of the Ford Motor Co.'s assembly plant is indicative. During the last fiscal year for the Ford branch, which ended July 31, 1916, 25,954 cars were assembled and sold, while the number built since Aug. 1, 1916, totals almost as much as all that were produced during the previous fiscal year, the actual number to date being 22,232. The production program for this year calls for between 50,000 and 60,000 cars. Freight cars are and have been at a premium in the Twin Cities for several months and the situation is more acute just at present than it has been previously. Officials of the traffic bureau estimate that Minneapolis industries in general are not getting more than 10 per cent of their requirements.

The Ford branch received 1760 carloads of parts during the fiscal year ending July 31, 1916, and since that time received 1200 carloads. Outgoing shipments during the last fiscal year were 2981 carloads, and since Aug. 1, 1916, 2353 carloads have been shipped. No cars are stored in Minneapolis at the Ford company and production at present is kept in harmony with the number of freight cars available.

#### Car Shortage Serious

As an evidence of how car shortage effects industry in Minneapolis the Washburn-Crosby Co., during the last few weeks has averaged 7700 bbl. of flour a day in its plant whereas its capacity is 28,000 bbl. daily. This is the average situation. In few if any of the manufacturing concerns are running over one-third their capacity. Flour to-day in carload lots is selling for \$8.40 a bbl., whereas a year ago it was \$6.35. The highest mark reached in the last few

weeks is \$9.65 a bbl. So urgent has become the demand for freight cars that the Minneapolis Traffic Association has sent a committee to make a plea before the Interstate Commerce Commission for the release of all cars being held in the East at the earliest possible moment. Over 25,000,000 bu. of wheat and millions of bushels of oats, barley, corn and rye are tied up in elevators in Minneapolis. Millions of bushels more lie in cars in the railroad terminals and on sidings in the territory surrounding Minneapolis.

What is true of the grain situation is true in a measure with automobiles. Of course, at present the call for cars for retail sales is not heavy, but the car factories are anxious to move as many machines to points of distribution as possible to avoid storing them at the factory and several manufacturers are now shipping cars from Minneapolis and storing them as rapidly as they can get freight cars to handle shipments.

One big branch manager in Minneapolis who has sold his entire allotment took occasion to classify Montana as one of the best present sales districts in the Northwest, which, according to him, is doubly as good as a year ago. North and South Dakota are not considered as good as in previous years, and the same might be said in Minnesota, yet in these three States there is a golden opportunity for aggressive car salesmen. Montana people have had greater incomes in 1916 than at any time in the last 10 or 15 years, and it is here that more of the big, high-priced cars are being sold in this State than elsewhere in the Northwest. There is more difficulty in getting cars for delivery than in selling them.

#### Tractor Industry's Capital

The agricultural tractor business, which may be said to have been in its infancy in the Northwest a year ago, has shown phenomenal growth. Minneapolis and St. Paul are now acknowledged as the home of the agricultural tractor industry, and whereas a year ago a few tractors were demonstrated outside the show, this year eight makes were exhibited inside the show building. The Twin Cities bid fair to become to the tractor industry what Detroit is to the automobile trade, Pittsburgh to the steel industry or Chicago in live stock. There has been considerable development in the tractor field within the last year, and much is expected in the future, as experimentation is carried on to a remarkable degree and many of these experiments no doubt will develop into worth while tractors.

Banner crops for the last 2 years have proved to the farmer the necessity for mechanical tilling of the soil, and it should be a source of satisfaction to the

tractor industry to know that so many of the farmers of this territory are now converted to automobiles. Since the farmer is a heavy car buyer, he has learned the utilitarian value of the gasoline engine, so that it is not necessary in selling tractors to sell him the engine. Farmers already are sold on that. The only question is that the farmer has enough ready cash to replace his horses with gasoline powered machinery.

It is a noticeable fact that the tractors exhibited at the show this week for the most part are moderate in price. It seems logical to suppose that the tractor industry will follow closely the trend exhibited in cars and trucks, since it is already true that the low-priced tractor is the one in which the farmers display the greatest interest.

Tractor manufacturers have found that the car dealer is the logical sales man of tractors since it has been shown that half of the cars sold in this territory at least go to farmers. From this it would be seen that it is quite in harmony with the present movement in the business of the car dealers to handle tractors, and it is not uncommon to see in the salesrooms of the various car dealers in Minneapolis the useful if not ornamental tractor lined up beside the latest models of automobiles and making a strong bid for attention.

#### Future Is Favorable

Whether we speak in dollars or bushels of grain makes little difference. It is a foregone conclusion that automobile sales in this great Northwest territory, which embraces 306,434 square miles, will be greater than ever before. Last year it was a story of tremendously greater crops than in 1915 or other previous years, while this year it is more a story of practically equal crop volume, materially enhanced in value. Last year the farmer's financial debts were cleared through the bumper crop which paid his back payments on lands, back taxes and redeemed his notes of more or less long standing and left him with money in the bank. Then came 1916 with high prices and a good crop which gives the farmer an income equal to that which he got the year previous, and inasmuch as he did not operate under the handicap of the previous year, he should be more than ever a good prospect for the sale of a car.

Just a word may be in order as to the vastness of this great territory. The entire population of the United States might be placed within it and there will be less than 350 people to the square mile.

#### Kentucky Licenses Number 20,637 in Jan.

LOUISVILLE, Ky., Feb. 10.—The commissioner of motor vehicles of Kentucky issued 20,637 automobile licenses in January and received \$150,467.69, an increase of 69 per cent over last year.

# Foreign Trade Department

## Manufacturers Must Study French Market—War Region Covers Greatest Engineering and Raw Material District—Enormous Amount of Supplies Needed—Report of Special Committee of Fifteen

By David Beecroft

**T**HE present condition of France, both the invaded area and the remaining part of the country, as well as the condition of France at the close of the war, are questions which every automobile, motor truck and accessory maker should adequately consider at these times. This applies also to manufacturers of tractors and those specializing in machinery for the automotive industry.

A most valuable work dealing on this subject is the report made to the American Manufacturers Export Assn. by the special committee of fifteen which spent some months last fall in France traveling over the entire country and investigating all of the industries. The report is a well illustrated volume of 250 pages which deals in a most comprehensive manner with the France of to-day, its manufactures, labor, credit, shipping, reconstruction work, personal welfare and, in fact, every phase of life which would interest a manufacturer anticipating building up French trade at the completion of the war or taking advantages of the possibility of reconstruction work in France after peace is signed. We are taking the liberty of quoting very generally from this report, a copy of which should be purchased by every manufacturer connected with the automobile industry.

### Devastated Area

The report gives a very comprehensive conception of the area of France devastated by war and at present held by Germany. Approximately 4 per cent of the total area of France is now in the hands of the Germans, this constituting one of the richest sections of the country both from a point of view of production and also manufacturing. For example, quoting from the report:

"Eighty per cent of the iron ore is in this zone.

"Two-thirds of the coal mines in France is in this zone.

"Factories and mills to the number of 330 have been destroyed, throwing out of work approximately 57,633 persons, and depriving families of the workers of support.

"Four cities of over 100,000 inhabitants, Lille, Roubaix, Nancy and Rheims, are either occupied by the Germans or under fire. The population in this invaded district is about twice as dense as the average in France. In 1912, \$50,000,000 worth of cereals, or 10 per cent of the total production, was raised in this region.

### Reconstruction Plans

"Seven hundred and fifty-three towns and villages have been in part or wholly destroyed. In these 753 towns, 29,594 buildings have been damaged and 16,669 completely destroyed. Of these, 15,300 are in the department of Pas-de-Calais. In the department of the Marne over 15,000 have been damaged or destroyed. In 148 towns over half of the buildings have been completely destroyed, and in seventy-four towns 80 per cent have been destroyed.

"There are in France to-day 928,000 refugees, driven away

from their homes, one-half of whom are under 16 years of age. Of these, 123,000 are Belgians. There are probably 120,000 others who are not recorded because they were self-supporting."

A good indication of how the new thought in standardization of materials has entered into the French mind is evidenced by plans already made for reconstruction work in this zone; and while this reconstruction work does not directly concern many in our automobile industry, it does sufficiently indicate or point to changes in French manufacture which we should be aware of. This reconstruction work, according to the report, divides itself into two classes:

"1—The necessity of rebuilding the devastated villages and towns has developed the thought of standardizing all materials such as window sashes, doors, hardware, wired glass, plumbing and lighting fixtures, cheap furniture, cooking utensils, house furnishings of all descriptions, etc. . . . There must also be a general replacement of all sorts of agricultural tools, implements, agricultural machinery. . . .

"2—The northern section of France is chiefly an industrial region in which are concentrated most of the important industries of the country; and as much of this section is still in the hands of Germans no accurate estimate can be made of the damage done. It is likely that many of the industrial plants will have to be rebuilt and much of the machinery will have to be replaced. . . . A special society, the central committee, has been formed for rehabilitation work in this section. . . ."

With this conception of the devastated area and the possible plans for rehabilitation, the report proceeds to give a broader conception of reconstruction work in France and suggests that while reconstruction work in the devastated area is large, it is possible that reconstruction work in other parts of the country which have not been injured by war will exceed that of the war-torn zone. The report goes on to show in a few details the broad nature of this work.

Under the direction of the Touring Club of France, it is planned to be ready at the end of the war to undertake immediately \$120,000,000 worth of construction, enlargement and reconstruction of hotels in the resort countries so much frequented by American tourists automobiling abroad. The hotel business is expected to be one of the first to recover after the war and to be placed on a substantial paying basis. A comprehensive campaign of publicity has already been started by the Touring Club of France through its 130,000 members to advise the world, that is, all countries outside of France, of the movement to inaugurate a first class hotel system in France and also to invite capital to take part in it. The French Government through the Senate and the Chamber of Deputies is giving it support.

We quote further from a report on this reconstruction work:

"It is being found generally in the industrial world that

co-operation and the exchange of experience and ideas are more important than competition. This is particularly true in the hotel industry. . . .

"A number of motor buses have already been put into operation throughout the scenic parts of France and many more will be established immediately after the war. The fine character of the French roads, together with the charm of country, adds much to the delight of this form of travel. . . . For some time an active campaign has been carried on to make known the scenic charms of France."

#### French Trade

For those U. S. A. manufacturers in the automobile industry looking to France specially as a selling field at the close of the war, it is best to bear in mind that Europe developed and perfected foreign trade. Foreign trade and foreign finance are creations of European brains and consequently we cannot expect that in the few years of war the United States has solved more of the problems of foreign trade and finance than Europe. Unfortunately the abnormal war trade has closed the doors of foreign trade education to us. We have been merely merchants filling foreign orders, rather than merchandising experts going into the foreign field and building up an export trade in the face of world competition.

In view of this we cannot do better than quote from the report substantiating the old-time honored conception of foreign trade, namely, that it is an exchange of commodities.

"If we wish to increase our exports to France we must be ready to import correspondingly more than we have done in the past. Trade is a matter of exchange of commodities; we cannot hope to increase our export trade under normal conditions without a proportionate increase of imports from the countries to which we sell."

As we mentioned in connection with our series of articles dealing with developing of export trade in South America, that it is always essential to send our best business men to foreign countries to develop trade by a careful examination of conditions, and later to place some of our own citizens in charge of the business, so we can repeat here. The report sums this graphically as follows:

"The country which expects to export its goods must first export its men. The proper method of developing business will be in most cases to send men to France who understand the language and are thoroughly familiar with French lines of manufacture."

#### French Financial Standards Sound

Many of our manufacturers may be holding back on foreign trade with belligerents owing to the question of financial soundness in those countries, and also because of credit terms that may be required. The commission went into credit matters very fully and is of the opinion that there is no other country in the world to which our manufacturers should be prepared to extend credit more than to France. This is largely because of the French national character and the national sentiment built up through centuries surrounding the question of meeting your financial obligations. The report expresses the situation thus:

"Credit can be given with more safety in France than in most other countries: Failure to pay a debt is deemed a disgrace which the whole family will try to prevent. Failures are rare. The responsibility of rural credit associations is amply provided for by law. We were reminded that our agricultural machinery sometimes is sold in France on three payments; one after the first, one after the second, and one after the third season, and that while it may become necessary to grant the same concessions on shipments made to France, the security can be considered at least as good."

The question of competition that we may expect from France after the war was investigated quite fully by the

commission in the various industries studied, and the consensus of opinion as expressed in the report, is that there is little possibility of large surplus stocks of French goods manufactured under war-efficiency methods at present, and that there will be little danger of the American market being flooded by such.

#### France and America Not Competitors

The report takes the view that France and America are not likely to be serious competitors in the world market because their strength lies in different directions. The answer to this is found in the national characteristics of the two countries, France with strong tendency toward individual design and manufacture, and America leaning toward production of standard types in great quantities. It is worth while quoting from the report on these two national characteristics.

"French manufacturers are likely to go further than they have already done in their effort to meet the demand for high grade merchandise made up in particular ways for individual customers, and in relatively small quantities for a high class trade. . . . The French industry has arisen primarily to satisfy home wants, which are not large but very diversified. This has enabled France to meet the varied wants of other countries and to fill relatively small orders for specially artistic goods with special imprints and special styles of packing and to do so at reasonable prices and yet with great profit.

"In many industries it will not pay French plants to enter upon large and continued production of one article in great quantities; but on the contrary the peculiar strength of French industries lies in the fact that their plants are capable of turning out a great diversity of articles, each finished with artistic production, in a way which other countries cannot because such excellence is the result of the artistic endowment of the French people.

"It is admitted that in all French industries the factories could be improved, and that a better sequence of operations could be adopted, but it is contended that the production itself should remain diversified as heretofore. Extremists championing this view sometimes go so far as to oppose a general introduction of machinery, automatic tools and labor-saving devices on the ground that the product would thereby lose some of its artistic qualities.

"It is reasonable to expect that in those lines in which France intends to supply her own wants entirely, production operations must be more generally adopted, and this may result in surplus production that could be successfully exported."

In contrast with these national French characteristics with regard to manufacture, the report sets forth that U. S. A. manufacturers are only interested in exporting their surplus product and that they would not be well qualified to compete with France in special products.

#### Will Need Improved Machinery

While the report does not specifically state that there will be a great deal of reconstruction work done in factories after the close of the war, it does throughout its pages breathe the impression that already much has been done in production manufacture in France. Two cases are specifically cited, one motor trucks and the other munitions. Modern machinery and labor-saving devices are not used in France to-day to the same extent as in the United States, in plants of corresponding importance. Labor-saving devices and improved machinery will, however, be required as never before, and designs which have been developed under high labor costs and great production in America will probably receive favorable consideration in France. The war has already stimulated development along these lines more than many years of peace would have done. In the steel industry, as well as in ord-

nance factories, hydraulic forging presses and high-pressure pumping machinery have been installed. Many of these have come from the United States. The demand for such machinery has passed its maximum and will no doubt practically cease with the end of the war.

The fact that France does not view with antipathy our prestige in production methods is shown by the sentiment widely met throughout the country that French industry will welcome American manufacturers and American capital cooperating with French interests in the erection of new factories in the country. This suggests the possibility of American manufacturers of production cars probably being welcomed in the French field. It is possible that even yet France has not accepted the production automobile and that she would welcome American factories in the country to build this type.

Some useful information is given in the report on the great problem of labor which has been one of vital concern to the United States manufacturers. Both labor and the cost of living have gone up in France since the war, but perhaps not to the same extent as in America. The great influx of female labor has to a large extent made up for the depletion of men workers in the factories. Female labor has been placed on a par with male labor in many factories so far as pay is concerned. It appears that in factory work woman is practically as efficient as man and requires less supervision. In the agricultural field woman has not been so successful in France and last year's crop was approximately 25 per cent short, largely due to female labor.

In French factories the working day averages 10½ hr. Previous to the war there were many factories operating on 8 and 9-hr. schedules, but these were generally increased to 10 hr. when the war started. French factories have taken advantage of every possible factor to keep production up to standard. It has been found best to alternate day and night shifts from week to week, rather than keeping one set of men or women constantly at night work and another at day work. Under this condition the work of the night shift is practically as good as the day shift. Night work generally falls off in efficiency between the hours of 2 and 4.

The cost of living in France averages one-third to one-half higher than at the beginning of the war and still rising. Certain commodities have advanced as much as 50 to 100 per cent.

Generally speaking, the cost of labor has advanced from 30 to 70 per cent; highly skilled work in some instances as much as 100 to 150 per cent.

We quote from the report on this subject:

#### Women in Every Industrial Branch

"Apparently women doing work in factories that involves no prolonged training receive from 70 cents to \$1.20 per day; and men of the same class from \$1 to \$1.80 per day. Skilled agricultural labor, such as vine trimming, cheese making, etc., is 80 cents to \$1 per day. . . . There is no indication of a decrease of the present wage scale after the war. It is believed that wages will remain substantially at whatever point they may have reached at the conclusion of the war. It remains to be seen at that time to what extent women will remain in the industries.

". . . Much of the munitions work is done by the piece, male and female labor being paid on the same basis. In other forms of labor the turn is 75 per cent of that of the men for woman labor, especially where the work is of an exhausting character. Under the stress of urgent necessity, it has been found possible to employ women even in the heavy work of steel plants. We saw women handling shells as they came white hot from the furnace. Women run large machines, such as lathes, etc., which it has been assumed could only be handled by trained mechanics."

The more general employment of labor through French factories has already resulted in many factory improvements for workers' welfare, as well as the installation of many labor-

saving devices. Special washrooms have been installed; special arrangements have been made for the preparation of hot food; dining rooms and rest rooms have been provided, especially for those who work at night; and arrangements have been made in factories to obviate the necessity of women lifting heavy articles. In some factories women are allowed to leave their children in the care of trained nurses in homes near the factories.

Child labor has always been a factor in France, and according to our standards, children begin work in French factories at too early an age. The French nation is considering this problem and realize very fully that the future of any country depends on the care given its boys and girls. The report states that, "In many factories munitions girls were working with their mothers, the mothers instructing the daughters and keeping in touch with them during the day. The results were very satisfactory. Children generally work the same hours as adults . . . children enter some factories at 12, and until they are 18 are protected by a number of laws regulating wages, sanitary conditions, rest, hours of work, etc. . . . In many plants boys are paid more than girls doing the same work, because they come to the plant as apprentices, whereas many of the girls remain only from 12 to 18 months."

#### Low-Priced Automobiles Needed

The agricultural status of France is perhaps not as correctly understood as it should be, and particularly as it has a very direct bearing on the possibility of using farm tractors and also low-priced production motor cars. France is very rich in land and has a very high percentage of its total area under cultivation. Out of a total area of 133,000,000 acres there were 59,000,000 acres of plowing land in 1912. It is estimated that there are about 85,000 farms which should be using motor apparatus for plowing, etc. The commission estimates that this would give a possible field for 17,000 motor tractors, such as we are building.

Generally speaking, French farms are small, the average being 22 acres. This would seem to cut down the possibility of selling tractors or automobiles, to a very few of the 5,500,000 farms in the country. The government has, however, for 2 years been encouraging farmers to get together in groups of seven or more and purchase motor equipment. With this object in view a decree was granted in September, 1915, permitting such co-operation among farmers. Already this is showing results. The French peasant is exceptionally frugal, and while they have not been good spenders in automobiles they have had sufficient money, but it has generally been invested in national securities.

#### Better Shipping Facilities Planned

The report analyzes exhaustively the question of foreign shipping and the enormous work France is doing in improving her great seaports. Much work is already under construction and plans have been completed to carry this on for many years to come. At the present time there are sixty-six steamship lines running from Marseilles to all parts of the world. The port of Bordeaux has sixty different steamship lines, and the other large ports are similarly well cared for. The report mentions that during the year 1915, Rouen, a port inland on the Seine River, had 3969 merchant ships during the year and only four of these were American. During 1916 ten American vessels entered this port. Rouen is the fifth port in France.

Already there is much reconstruction work taking place in many of the older French cities, much of which has been started as a direct result of the war. In one city 35 acres of old buildings have been destroyed to make way for modern construction. In other cities similar reconstruction work is under way.

# Engineering Progress Analyzed

## Part I

### Attainments in Performance, Comfort and Appearance as Exemplified in Cars at the National Shows—An Intimate Study of Chassis and Bodies

By J. Edward Schipper

Technical Editor THE AUTOMOBILE

**A** REVIEW of the great national automobile shows from an engineering standpoint means an inspection of the entire progress of the year. To attempt to do this in a short paper as this is quite similar to delivering a lecture on the world by the aid of a small globe. We will have to be content therefore with a view of the industry through the wrong end of the telescope, merely turning the glass around to observe some of the prominent heights and valleys. It is upon these high spots that discussion will naturally be focussed, and it is upon these pertinent questions that we are most anxious to shed the light of crystallized opinion.

No one thought stands out more clearly to a student of the shows than that this has been a great year for detail. Few if any basic movements can be seen and few if any great innovations. Nevertheless it would be wrong to say that there are no well-defined trends, but even these with a few exceptions are shown by changes in detail rather than in a radical or fundamental departure from previous practice such as featured the early days of the industry.

To appreciate what each of the changes to be noted is intended to do, the ideals toward which we are working in automobile design may be reviewed:

Better performance is the first. This means a greater speed range on high gear, better acceleration, better economy, longer life, silence, easy starting and other factors which render the car a vehicle which can be started, operated and cared for with the least trouble and expense and with the greatest amount of satisfaction to the user.

More comfort is the second. In this phase of development is included everything which makes the car a better vehicle to ride in. Better spring suspension, better upholstery, better body proportioning, ease of entrance, convenience in use in all kinds of weather and over all kinds of roads, convenience in night driving, in making minor adjustments and repairs such as tire changing, brake adjusting, battery filling and even gasoline and oil replenishment.

Finer appearance is the third. What this includes is self-evident. Body outline or profile, the finish and trim of the exterior and the design and adornment of the interior from the appearance point of view are all included.

Under the heads of performance, comfort and appearance our observations will fall and each detail considered will in the belief of the engineer who adopted it be a small or large step, in his opinion, toward one of these three goals. If the change has not done one of these three things it has not been a gain

from the user's standpoint although there is another consideration which we will not take up except in passing, and that is better manufacturing possibilities. The latter, while of enormous importance will be neglected for the time being in order to limit the scope of this paper as much as possible.

A glance at the requirements for better performance shows that insofar as the engine is concerned, a great many of the desired ends are closely bound up with higher mean effective pressures. This is reflected in the higher speed range, better acceleration and indirectly in other directions. The matter of higher mean effective pressure is naturally concerned with higher volumetric efficiencies, and this brings us directly to the first of the observations on the cars as they are shown at the national exhibits.

The sixteen-valve four, the better designed port, larger valves, larger intake passages and indirectly even the more efficient hot air stoves on the exhaust pipes are all concerned. There is hardly a car at the show that does

not exhibit changes in the arrangement of its gas passages and in the increased temperature of the mixture.

This is the first year that the stock sixteen-valve four has been exhibited at the national shows. There are three, two of which are developments by concerns which have been in the industry almost since its inception. The great importance of volumetric efficiency is recognized everywhere. The nearer that the intake stroke can come to filling the cylinder 100 per cent full, the nearer the maximum horsepower to the secured from a given displacement, with all other points in design being equal.

#### Demand for 16-Valve Four

Both the manufacturers who have put the sixteen-valve car into actual production report a quick public demand and around the chassis at the shows there was an appreciative audience who listened to the claims of the lecturers. The advantages that the latter put forward are primarily bound up in the question of volumetric efficiency, but beyond that other claims are being made. These include smaller valves for the same area, increased period of maximum opening, cleaner scavenging due to the elimination of pockets and reduction of carbon deposit. No disadvantages were mentioned.

The fundamental conception which is responsible for the sixteen-valve four, and the considerations which follow as a natural consequence of it, form probably the most important point in the entire show and doubtless there will be a few

**EDITOR'S NOTE:**—This is the first installment of a paper to be presented before the Detroit Section of the Society of Automotive Engineers Feb. 16 in which Mr. Schipper summarizes the results of an extremely close analytical study, not only of the automobiles at the national shows, but also of the specifications and details of design characterizing 1917 cars of all American makes. Mr. Schipper has been cultivating this field of research for many years and is eminently qualified to review the subject.

remarks heard upon it, as it is widely known that several related developments have acted as playthings elsewhere than in the factories that are producing them.

It is not only by the addition of valves that higher volumetric efficiencies are sought. There are several notable manufacturers at the shows who stated that their motors are from 12 to 20 per cent higher in power than they were a year ago without any great change in piston displacement. Smoother ports, altered cam design, increased intake valve size, shorter manifolds, elimination of bends in the gas passages are universal. This year there were several cars exhibited in which the intake valves were larger than the exhaust. This is a reversal of what was thought to be the best practice a few years ago when the exhaust passages were in a great many instances considerably larger than the intake.

#### Overhead Valves Increasing

Another line along which the higher intake efficiencies have been sought is in the increased use of overhead valves. The overhead action in which the valves open directly into the center of the combustion chamber from above is on the increase. The old objection of noise seems to have been greatly done away with by the use of covers, by inclosing the wearing points and by the reduction in clearance due to a redesign of the valve actuating parts. Claims of great horsepower to weight ratios are being made by nearly all the concerns having engines worked out along these lines. One newcomer in the small car field who exhibited both at New York and Chicago showed a  $3\frac{1}{4}$  by  $5\frac{1}{4}$  four-cylinder engine which developed slightly over 42 hp. at 2400 r.p.m. according to tests carried out in a prominent commercial laboratory in Detroit. This

works out on the B.H.P. =  $\frac{P. L. A. N. E.}{33,000}$  formula, at 106 lb.

per square inch m.e.p assuming  $E = 75$  per cent mechanical efficiency. Brake m.e.p is 80 lb. per square inch. At a car weight claimed to be 1900 lb., although I have had no opportunity of checking the figure, this would mean a horsepower for every 45.3 lb. of car weight, and a horsepower for every 4.13 cu. in. piston displacement.

This is cited as a typical example. It illustrates what is seen on every hand at the shows this year in a reduction in car weight and an increase in available horsepower at wide open throttle. The torque at the lower speeds, however, has not always been given the same attention, although it can be taken as a general fact that torque curves are flattening out. This again comes back to higher mean effective pressures and is largely due to the better filling. The most important result of the high power to weight ratio is of course in accelerative ability. The demands of the public are for quick get-away and naturally this means high power. It also means that our normal traveling has to be done at low throttle opening with a consequent low thermal efficiency. The question of performance at low throttle openings is a much more important topic than can be adequately dealt with in a paper with a wide scope, and naturally is something in which the carbureter designer is interested as well as the engine designer.

#### Detail Engine Changes

Detachable cylinder heads are increasingly prevalent in cars using small-bore power plants in either four or six cylinders. The difficulties of keeping the gasket tight have led to a redesigning of some of the engines that were shown with detachable heads a year ago. In one instance where a new head has been fitted, the change was made because it was noted that when tension was placed on the studs holding the head in place there was a tendency to draw the valve seat out of round. The amount of metal around the studs has been increased and the stud itself carried further away from the valve. The number of studs in other designs has been increased in order to give an even distribution of pressure all over the surface of the gasket.

On the stripped chassis and the cut-away engines the lecturers discussed balance. The educated car buyer does not like vibration and knows enough to ask what is being done to eliminate it. At the Chicago show there was a small gasoline power plant used in connection with a gasoline electric in which the gasoline engine is designed to run continuously at close to 3000 r.p.m. The counterweights on the shaft of this engine are carried as close to the plane of rotation of the crank center as is possible, still leaving a passage for the connecting rod. A number of improved shafts for sixes also were to be noted with a large following for the curved-check shaft.

#### Influence of the Fuel Question

The fuel question is exerting an important influence. Some signs of the descending grades are noticeable on every car in the show. Hot air stoves are more elaborate than ever before and in spite of the struggle for higher volumetric efficiencies, the use of the heated intake manifold is growing rapidly.

When it is considered that the temperature of the intake manifold in winter is quite often below the dew point of the present grades of fuel when the vacuum in the intake is within certain limits and at the mixture proportions in general use, the tremendous importance of this manifold temperature will be realized. On all the cars shown there is evidence of the practical realization of the problem, and it is hard to tell where the carbureter makers have ended and the car makers begun. It has been realized that with the present grade of fuel the manifold must complete the work of the carbureter or at least not detract from it. It is hard to say, looking at the show chassis which represent the thought that has been put upon this point, if the carbureter has been reduced to a simple mixing contrivance with the work largely carried on by heat in the manifold, or not.

If the heated manifold is to do the work, it seems impossible to have the same design as applicable to the heated summers of the South as to the cold winters in the North. Particularly as in many instances the warmer climes have the more volatile fuel. Prospective car buyers who keenly follow developments in the automobile engineering field have already started to ask that question.

Along the same line almost a dozen makers were on exhibit with thermostatic or other control of the water temperature. Some used the shutter controlled by hand, and at least one inquirer was heard to ask if the shutter were thermostatically controlled, a development at present under consideration. It has always seemed incongruous to see a \$3,000 car with a piece of newspaper across the front of the radiator. It is regretted that there is not more opportunity to dwell on the temperature question, as it seems to embody some of the most important considerations that are before the automobile engineers of to-day. The question is being wrestled with by engine builders and carbureter maker alike and the necessity of co-operation cannot be too well realized.

#### Engines Generally Not Lighter

Generally speaking, engines are not lighter than they were at the shows in the beginning of 1916, although developing more power per weight unit. Reciprocating weights have decreased still further, but it is doubted if the aluminum alloy piston has taken any firmer hold. It still seems to be occupying the debatable ground and those who have it are very strongly in favor of it, while those without it are just as strongly opposed. Inquirers at the exhibitors' booths could get plenty of information on both sides of the questions. One point, however, which is very noticeable is the fact that engine manufacturers generally have learned how to make lighter iron pistons. Just as the multi-cylinder engine has forced better performance from the four, so the aluminum piston has forced better iron pistons. Some of the latter are now made so light, that the direct saving in weight by using an

aluminum piston with its heavier section is quite small and negligible except at very high speeds. It is noticeable that the aluminum piston is in far greater favor among the car manufacturers who make their own engines than it is among those who make engines for the trade. Where aluminum pistons are used they seem to be longer than those first employed.

#### Some New V-Engines

Some new members in the ranks of the V-engine manufacturers demonstrate, what was predicted generally 2 years ago, that the type had a definite field and would increase. One of the new eights is a Knight and the other an overhead poppet type. Both are produced by concerns that are noted for their great quantity production and hence whose endorsement carries a great amount of weight. Talks with those showing the type and others indicate that on every hand it has been considered a matter of cost and performance. Some believe that they can secure better performance from the eight for the same cost as the corresponding six, and vice-versa. The shorter, stiffer shafts of the V-engine are dwelt upon at length by the demonstrators of the type as well as of the smoothness of power flow; those who speak on the other side mention equal performance with easier maintenance, thus leaving the question open to debate with a growing popular demand for the V-type.

#### Pressure Oil Feed Increasing

One of the points most frequently asked about by the show visitors is the oiling system of the car. The increase in pressure feed systems is particularly noticeable. The increase in pressure systems and in the amount of pressure used has gone up almost in direct proportion to the increased piston speeds of the engine. With many designers stating that a piston speed of 2000 ft. per minute is desirable for passenger car service, naturally a great amount of attention has been focused on the maintenance of the oil film.

This is a trend that has been growing. A census taken at the shows in 1912 showed 10 per cent of the models using pressure feed and 20 per cent using a combination of splash and pressure. This is a total of 30 per cent, putting the oil into the main bearings under pressure. To-day 30 per cent of the chassis models use full pressure feed and 35 per cent splash and pressure, or a total of sixty-five feeding by direct pump pressure to the bearings. It is not uncommon to have the oil pressure as high as 40 lb. per square inch with the oil exercising a marked cooling effect on the bearing. The question of taking the heat away from the oil is an important one, and recent reports show that special provisions are under development for this purpose. In fact, crankcase temperatures are being studied more carefully than ever in an effort to preserve the quality of the oil to as great an extent as possible. This is particularly important in view of the great amount of unburnt fuel which is finding its way into the crankcase and destroying the quality of the lubricant.

In cooling there is very little to be noted from a superficial examination of the show cars. Pump cooling leads, with about 66 per cent of the chassis using it. With the detachable cylinder head it has been found necessary in a few instances to increase the amount of water around the head. It may also be stated that on the newer engines more care is being used to eliminate steam pockets and hot spots due to masses of metal. The water is being carried closer to the exhaust passages and also closer around the spark plugs.

#### Gas and Combustion Chambers Refined

Valve actions do not appear to be greatly different. In the overhead rocker arm type there seems to be a tendency toward a differential rocker. With this the travel of the rocker on the push rod side is less than on the valve side. This permits of a lighter spring for closing the valve due to the leverage. Another gain claimed is in a quicker lift with

a longer maximum opening, a detail that again reflects the effort for higher volumetric efficiency. On the other hand, others have not adopted it, on account of the difficulties entering into replacements, while conceding some of the advantages. The service station would be forced to carry an entire different set of valve parts.

It is in the combustion chamber that some of the most important changes of the year have taken place. By changing small details and by an alteration in the gas passages, the power of the engine has often been increased to a surprising degree. One interesting detail which illustrates this is where a maker has made the gas passage below the valve in venturi shape with the throat of the venturi just below the valve and so arranged that the valve seat forms a continuous part of the venturi wall. This is on the small four mentioned as part of the gasoline-electric unit at the Chicago show.

Before leaving the combustion chamber a detail in manufacturing practice may be mentioned. This is the accuracy being required for equality of combustion chamber volume. One manufacturer of fours insists that the combustion chambers check within 3 c. c. for accuracy. With the great care taken in balancing the high speed engine the need for accuracy in this respect is naturally self-evident.

A development of the power plant that is receiving more attention every year is its accessibility. The national shows are visited by large numbers of repairmen who come for the purpose of seeing developments from their angle. Naturally one of the first considerations is accessibility. Engines which can have the pistons pulled out from the bottom without removing the crankshaft are well liked and are being looked for. This question has been given attention wherever feasible. The detachable cylinder head involves the gasket question and there is a great amount of difference of opinion as to whether the gaskets can be kept tight with the high compression engine. Another point is oil pump location, and the ease with which the pump can be removed. One new stock engine used in several cars has the oil-pump so that it can be removed quickly by taking four studs out of the bottom of the case. Others are working along the same line.

#### Clutches Must Disengage Without Drag

After the power has been developed the next question is to transmit it efficiently, and the improvement in power plants is naturally reflected in the transmission units throughout the chassis. The first of the units, the clutch, shows the improvements clearly. Examining fifty-four stripped chassis at the New York show and the fifty-two at the Chicago show, one of the facts that stands uppermost is the falling off in the number of adjustments. The majority of clutches examined were those made by standard parts makers and talking with these, the opinion cannot but be gathered that there is a practical unanimity of aim. This is briefly to secure the lightest possible efficient clutch for the torque and power delivered, and to have this clutch automatic as regards lubrication, with wear compensation in the mechanism itself.

Many of the clutches shown on the chassis have no adjustment except that on the clutch pedal. A running distance of 50,000 miles or more without attention to the clutch is claimed by some.

Clutch linkage has been altered. One of the newer cars exhibited at the shows makes a point that the clutch can be disengaged by the pressure of the hand. This means that the travel of the clutch parts for disengagement must be small, because the distance that the pedal moves is about the same as usual. Another possibility is increased area of frictional surface with a lighter engaging spring. The use of fewer disks on the disk type, which is increasing, reduces the necessity for long travel in disengaging and is one of the factors that is making for lighter acting clutches.

The increase in the speed of rotation of the clutch parts due to higher gearing at the rear axle has had a result in

reducing the torque which consequently has its effect on clutch design. Lightness in the rotating parts of the clutch has increased with a tendency toward quieter gear shifting. No great increase in the use of clutch brakes could be noted, but on inquiry it is found that quick release is being made a particular study and where it is secured the clutch brake has been done away with by some makers. This quick-acting release is simply a prevention of drag while releasing. It is this drag of the clutch when it is not fully released that gives clash in shifting gears.

#### Gearboxes Not Changed

As far as the gearbox is concerned there is little change to be noted. The unit power plant is still gaining with a notable increase in the use of the standard S. A. E. bell housing. There has been some simplification in the mounting of the control levers and also an increase in accessibility. Iron is used to a greater extent in gearbox housings this year because of the higher price of aluminum and also because of non-resonant qualities. The unit power plant is now used on 77 per cent of the chassis.

A feature in transmission units that will bear watching is the use of the electric transmission. At the Chicago show were three cars using three different forms of electric transmission. The question as to whether the gearbox will eventually be eliminated could certainly not be answered from a study of the show, but the exhibition of three distinct types of gasoline-electric drive is highly interesting. In addition, one car showed the magnetic gearshift as standard equipment. All of these attracted an unusual amount of interest.

The full floating axle has dropped slightly in the percentage figures of chassis listed. It is now 43 as compared with 52 a year ago. Semi-floating has gone from 23 to 25 per cent. The use of spiral gears has increased owing to the fact that it is now a little easier to get the equipment for cutting them. They are now on 70 per cent of the chassis models.

#### Semi-Elliptic Springs More Popular

One of the most notable changes of the year is in spring suspension. This may be realized from the fact that there are more than twice as many models with semi-elliptic springs than a year ago. The percentage of cars using semi-elliptics, from a census taken at the show this year is 36. Last year it was on 15 per cent. The drop-off has come in the three-quarter elliptics. A year ago these were employed on 42 per cent of the chassis; they are now on 27 per cent. The percentage using cantilever springs remains the same. There is a tendency toward placing the springs directly beneath the frame instead of to the side.

#### Hotchkiss Drive a Factor

Probably the spring change has been influenced more than anything else by the use of Hotchkiss drive which is now on 44 per cent of the chassis models. The half-elliptic springs along with the other types have been lengthened on a great many of the cars, and the study of easy suspension is one of the most important factors in the comfort of the present chassis. The increased deflection per unit of weight gained by longer springs has resulted in a redesign of brake layouts in some cars. This is particularly true where the Hotchkiss drive is used, as there is always danger of brakes binding if the centers and radii are not carefully laid out.

Brake details have been given more attention this year than for some time in the past. One of the reasons is the increased use of Hotchkiss drive. The points in which the brake designs are better are particularly in the equalization, in the elimination of rattle, and, as mentioned previously, in the proper layout of pivot centers and link radii. Quite a few are using a continuous cable equalizing system in which the cable runs over pulleys; others are using cable to supplant the linkage. While on the subject of brakes, the vacuum brake which was demonstrated at the

shows cannot be passed by without mention. This is a matter of which the true value will be determined by experience. Probably everyone is familiar with the operation of the vacuum brake, in which the suction in the intake manifold amounting to a few pounds per square inch, negative pressure, is converted into a large force by the use of a piston of large area. A system of levers reduces the travel and multiplies the force correspondingly so that a powerful pull on the brake rod is obtained.

Electrically it cannot be said that any radical developments are to be noted. There has been further improvement in the mounting of some of the generators and starting motors, but in the design of the instruments themselves the changes are very slight. One prominent manufacturer has shifted his generator up with the fan and drives both from a V-belt. This is on an eight-cylinder car and it gives a very compact layout.

The Bendix gear is seen on what would seem to be on casual inspection a considerable majority of the cars. There are many magnetic engagements for the starting motor and a few mechanical shifts.

#### Two-Unit Electric Systems

The use of two-unit starting and lighting systems has increased. Probably the increased engine speeds are responsible for this to a great degree as well as the increased simplicity of generator drive. Another point in which increased simplicity is notable is in the generator output regulation. The three-brush system seems to be on the increase as compared with a year ago. The vibrator type of regulation is also more than holding its own, with bucking coil and others in the minority. No figures have been compiled on the percentages using the three types, but careful observation will confirm the trend toward the two first mentioned types. It is clearly noticeable that there are not nearly so many complicated systems as existed 2 years or even 1 year ago. One electric company has brought out during the year and incorporated on some of the cars at the shows a thermostatic unit which alters the charging rate to conform with the temperature conditions. This is a simple device, when analyzed, which simply switches in a resistance when the temperature of the generator increases above a predetermined amount. This temperature is generally about 150 deg.

#### Improvements in Ignition Field

Some real development work has been done in the ignition field as is quite evident on standard equipments. Probably the most noticeable feature is the better and more compact combination of the distributor and generator. The action of breaker mechanisms has been speeded up so that there is no trouble in handling even the most rapid of high speed engines. One manufacturer has brought out a new system which is seen on some of the cars and at the booth of the exhibitor, where the movement of the contact point is only 0.006 in. This is a closed circuit outfit.

*(To be continued)*

### Mechanical World Diary

THE thirtieth annual edition of the British Mechanical World diary and year book is now on sale in the U. S. by Norman Remington & Co., Baltimore, Md. It is one of the handiest compendiums of mechanical information and the fact that it deals with a number of British standards does not detract from its American usefulness. It contains information on almost every ordinary mechanical problem, from the best methods for soldering to the design of conventional machine parts. In the new edition sections dealing with heat treatment of simple steels, tables, for calculating the strength of coil springs and sundry other matters have been added and the book is remarkable value for money at its price of 35 cents, or 40 cents by mail.



# Chassis Oiling Needs Attention

Present Methods Behind Other Features in Design Progress—  
Advantages of Oil-Wick Feed Recommended by Some Authorities

**C**HASSIS lubrication is not as far advanced as other parts of car design. It is one of the details that has been overlooked while progress was being made in practically every other direction. There is hardly an automobile engineer who will not admit the faults of grease cup lubrication and particularly grease cup lubrication in which the cups are out of sight. The old rule of "Out of sight, out of mind," fits these cups very well.

It is natural that attention should be paid to the lubrication of the engine, for if it were not, the engine would not run. It is almost regrettable that the chassis will still run if no attention is paid to the lubrication, as it would then force a little more attention from user and engineer alike. The engineer in his efforts to make it easier for the user would have produced a better method than is found now.

## Grease-Cup Troubles

On some of the 1917 chassis there are as many as five and even seven grease cups located beneath the chassis in such a position that a man with his ordinary clothing on cannot think of trying to reach them. All these cups need turning at least once a week in ordinary running. The two conditions are incompatible and the result is that the cup goes unturned. The cups are also of such a construction that they are readily knocked off, particularly in truck work. A passenger car with from one to three grease cups missing after a year's service is not an unusual, but the *usual* thing.

In an effort to solve the problem, which is becoming universally recognized, there are a number of engineers at work. A system designed by C. T. Myers and carried out in his work on the Fageol trucks is illustrated on this page. As will be seen from a cursory study of the drawings the lubricant is oil. The advantages claimed for this are: First, the nature of oil to find its way to all working surfaces; second, the fact that a perfect film is presented; third, the non-dirt-carrying qualities; fourth, the absence of necessity for frequent attention, and fifth, the fact that the lubricant is supplied in proportion to the work done by the bearing.

It is pointed out in this plan of chassis lubrication that grease seeks the path of least resistance and will always try to escape from the bearing without lubricating it. It will lubricate only the surfaces which lie in its direct path of flow and will not readily be carried to all points of the bearing. Oil, on the other hand, will reach everywhere. It establishes a film between the rubbing surfaces automatically.

With the wick system as shown there is no possibility of carrying the dirt from the well of lubricant to the bearing

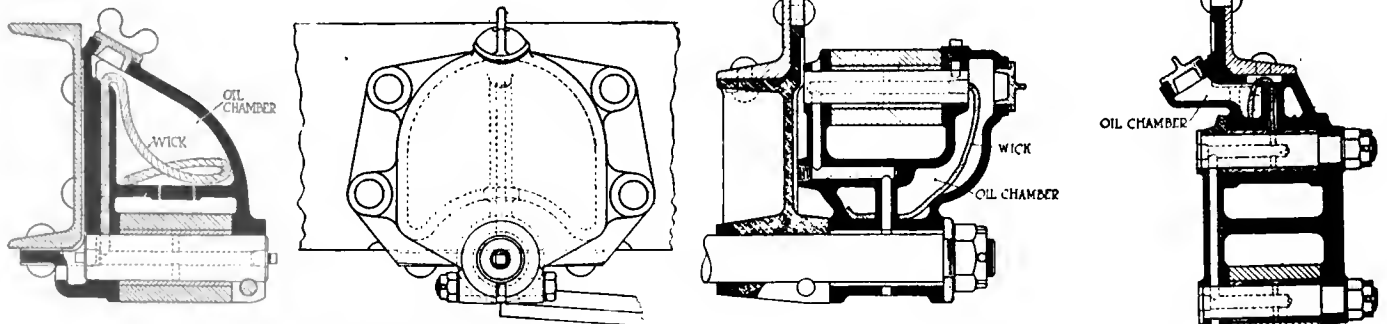
surface. In fact, it is pointed out that a handful of dirt could be gathered in the oil chamber without in any way affecting the efficiency and cleanliness of lubrication. The oil is drawn up through the wick by capillary attraction and only the liquid lubricant will be so conducted.

## Reservoir Size Optional

To avoid the necessity of frequent attention the oil reservoir in the system can be made as large as desired. With the proportions shown there will be enough lubricant contained for a month. The feed, of course, is automatic because of the wick arrangement and regardless of the amount in the supply compartment the rate of feed will depend only upon the amount used. The greater the motion of the bearing and the greater the amount of oil consumed, the faster the supply of lubricant will work its way through the wicking to the surface.

While the spring shackle oiling is the most serious of chassis lubrication matters there are also many other parts, notably universal joints and link joints in brakework, etc. The latter appears to be best taken care of by self-lubricating bushings where the designer has allowed sufficient dimensions to make these possible. Larger yokes and rod ends are being used by some manufacturers and equalizing shafts often have bigger bearings than formerly, permitting the use of softer bushing materials that do not need oil or grease but will not rust if left alone.

Universal joints, however, still require to be packed with grease every so often, and the packing is a horrible job. Luckily once is enough for a good many miles of running, but it would certainly be better for the life of the joints if something could be done to make it easier to attend to universals. The simplest plan is for the body to be provided with removable parts in the floor so placed that the joints can be got at from above, but there is room for a clever designer to provide for automatic oiling of the front universal from the gearbox and of the rear one from the axle. Schemes of this sort have been tried, and usually the trouble was that too much oil was supplied, but this should be possible to overcome; it must be no more than a matter of experiment to find the proper answer.



Sections of oil reservoir spring brackets

# Aeroplane Wing - Trussing\*

## A Clear, Simple Explanation of the Fundamentals of Aeroplane Construction

By F. W. Pawlowski †

IT is hard for an inventor or designer to break away from the forms, types or examples already existing in nature; the first efforts to build a flying machine were therefore attempts to imitate the flapping of birds' wings, just as there were attempts to build locomotives that moved on legs.

We know how the aeroplane was finally created. It is not a replica of a bird; it does not imitate the bird-motions in flight (except to a certain extent in gliding flight), but it still retains the essentials of a bird's wing, although modified and immovable.

The problem faced by our predecessors was to build wings large enough for a man-carrying glider or aeroplane and was an extremely difficult one. They had to answer these questions: How was the big wing surface to be made of light weight and rigid at the same time? How were the members of the wing framing to be arranged?

### Monoplane Wing-Trussing

The examples furnished by nature in the wings of insects, birds and bats, already adopted for the construction of the umbrella, imposed themselves so strongly upon the minds of inventors that it is no wonder we find their application in the early flying-machine, and even in Lilienthal's (1896) and Pilcher's (1899) gliders, Fig. 1, and Ader's aeroplane (1897).

The fact that Henson at the early date of 1842 adopted the Fink truss for his wing construction must be considered and recognized as extraordinary. High credit must be given his power of mind and constructive ability. The Henson wing construction contains all the essential elements of the modern aeroplane wing, such as front and rear spars, and main and secondary ribs. The reduction of the number of exposed wires as compared with the umbrella type was considerable, and it is really surprising that Lilienthal, Pilcher, and others did not adopt Henson's construction. Much later (1909) Levasseur adopted it almost without change for his Antoinette monoplane, Fig. 2. In this, as in most of the following figures, all the so-called lifting wires are shown by full lines and the so-called landing wires by dotted lines.

Several other designers of recent date adopted Henson's construction also, as it has the advantage of keeping the wings rigid even after they are detached from the body.

Although, in the meantime, the biplane wing became more prominent, we will proceed with the evolution of the monoplane wing. In 1910 Blériot adopted the Pratt truss, already popular in biplane construction, for his monoplane, which was of considerable span, Fig. 3. He evidently resigned voluntarily the possibility of almost doubling the wing area without much increase of resistance to motion.

Just a slightly different construction has survived until the present time in the German Taube, Fig. 4. The standard type of monoplane rapidly became the most popular on account of its simplicity of construction and ease of adjustment. Figs. 5 and 6.

The use of four pairs of lifting and landing wires on each wing, as in Deperdussin's seaplane, seems to be an unneces-

sary introduction of too much structural resistance. Two pairs of wires, Fig. 6, are the best, and are sufficient even for large-span machines; one pair of wires is sufficient for small-span racing machines. An example is the Ponier machine, which competed so splendidly for the 1913 Gordon Bennett Cup.

It is worth while to notice that in 1900 this type of wing trussing was used by Kress for his flying-boat, which was of a triple-tandem monoplane type, before any other machine flew. The interesting thing about it is that Kress was not an engineer but a tailor.

The resistance of the wires is a considerable item in the total structural resistance, so that Blanc in France actually built (1913) a monoplane with cantilever wings, Fig. 7, a rather risky construction considering the wing area used.

### Biplane Wing-Trussing

The difficulty of building large wing surfaces was realized as far back as 1866 by Wenham in England. He built a sort of multiplane kite, while Stringfellow in 1868 produced a triplane model, which unfortunately did not fly. But in spite of the remarkable example of Stringfellow, such prominent mechanical engineers as Sir Hiram Maxim (1888) with his huge multiplane, and Lilienthal (1896) with one of his biplanes, could not produce a simple and statically clear structure to combine the planes of their machines. A bridge engineer was the first to do so, and it was Octave Chanute who put the bridge truss in the biplane. Of course, it could be the Pratt truss only. The idea was adopted immediately by all airplane builders. As few of them were closely familiar with the principles of frame structures, there was some abuse of the "struts and wires" so that many biplanes of the early part of the modern era of aviation resembled closely the wire entanglement for field fortifications; this is shown in Fig. 8, in which the dotted lines represent the diagonals that were ultimately omitted.

The type shown in Fig. 9 soon became standard and prevails at the present time, the number of panels on each side varying from two to four in various constructions. Panels of equal dimensions, Fig. 9, are justifiable for bridge trusses, but are not the best for aeroplane trusses. By varying the width of panels, as shown in Fig. 10, the structure can be made of lighter weight or for the same weight, stronger.

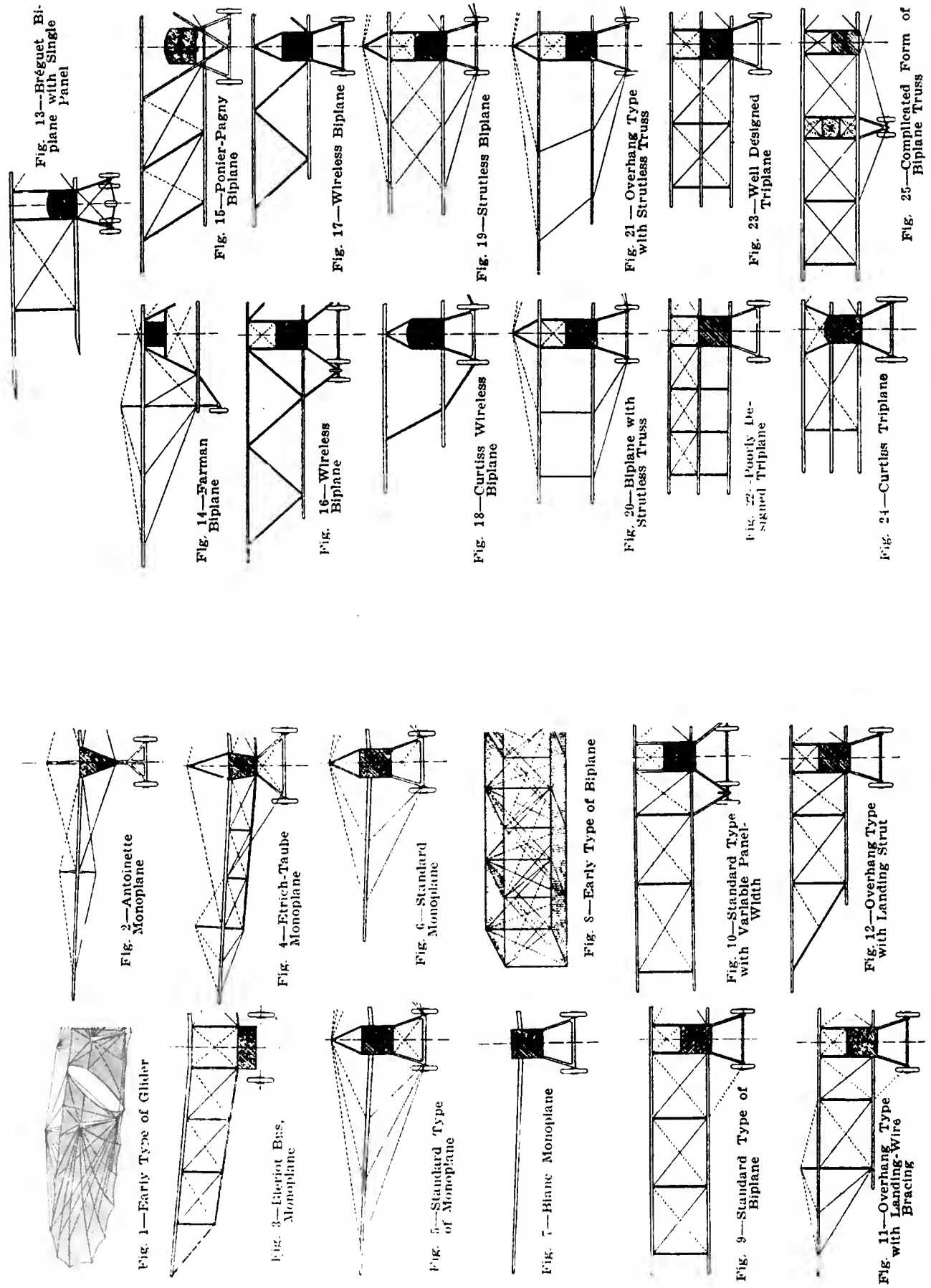
The forces acting in the spars increase from wing top toward the body; it is advisable therefore to decrease the bending buckling length of the spar stations. Also, for the struts and wires the arrangement in Fig. 10 is more advantageous as the forces acting will be more uniform; that is, the extreme struts and wires are loaded more than those in Fig. 9. The members close to the body are loaded less, thus rendering the dimensions of these members more uniform. This advantage of the *variable-panel truss* is not yet fully appreciated, although the arrangement appeared in France five or six years ago.

Then came the *overhang-type biplane*, with its well-known mechanical and aerodynamical advantages. It was introduced by Henry Farman but had already been incorporated in the remarkable triplane model of Stringfellow. It is inconceivable, however, that Stringfellow had the same rea-

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25 Different Designs of Aeroplane Wing Trussing



sons for using overhang as those which influenced Farman.

The overhang is treated either with *landing-wire bracing*, Fig. 11, or *landing strut*, Fig. 12, the latter arrangement being more advantageous as it offers less resistance to motion.

The resistance of struts and wires is a considerable part of the total structural resistance and the tendency to minimize the number of such members is therefore justified. An extreme example is one of the Bréguet airplanes, which had one panel 10.5 ft. long on each side of the body, in a machine of 40-ft. span, thus leaving about 8 ft. of free overhang on the upper wing, Fig. 13.

A more radical departure from the typical Pratt truss is displayed by the Henry Farman half-and-half monoplane and biplane machine, Fig. 14. The span of the upper wing is three times greater than that of the lower, so that the aeroplane is really a biplane (the central part) with two monoplane wings attached at the tips of the upper biplane wing. These machines are still in use in the present war.

The Ponier-Pagny biplane truss, Fig. 15, with equilateral triangles formed by struts and landing wires is a modification of the Pratt truss, as its essential members are the long diagonals of the rhomboidal panels.

**Wireless Trusses**

The real triangular bridge truss was introduced by the Albatross company in Germany about four years ago. The two examples shown in Figs. 16 and 17 are commonly known as wireless trusses.

The advantage is based on the considerable difference between the resistance coefficients of struts with stream-line sections and of wires or cables, the ratio or coefficient being about one to ten. As the thickness of struts is about ten times greater than the wire diameter, the elimination of landing wires by substituting for the lifting wires members that will transmit forces in compression as well as in tension offers interesting possibilities.

As a matter of fact, the total length of all web members of a wireless truss can easily be made much less than one-half the total length of all wires and struts of the usual truss, so that the resistance of the web members can be reduced almost one-half with a small increase of weight.

With this construction it is difficult to connect the wooden struts to the sockets so as to transmit safely considerable forces in tension; it is also difficult to rectify the structure after it warps. When the wooden spars and struts are eliminated turnbuckles and other adjusting devices are entirely unnecessary; also the difficulty of transmitting forces in tension is avoided, so it is curious why the wireless truss is not popular.

Just recently the Curtiss company has produced an interesting type of wireless truss, Fig. 18, in which the number and length of the exposed members is minimized. The construction is especially adapted to the fast small-span racing or scouting machines.

It is possible to imagine a *strutless truss* as a combination of two pairs of monoplane wings with the usual bracing, Fig. 19, but the total length of wires is considerable, so that the advantages of such a construction would be doubtful. Another form of strutless truss, Fig. 20, is much more promising and with the appearance on the market of wires having stream-line sections, it is possible that the structural resistance can be reduced even further than is the case with the wireless truss. Fig. 21 shows that this construction can be also well adapted for the overhang biplane.

**Triplane Trusses**

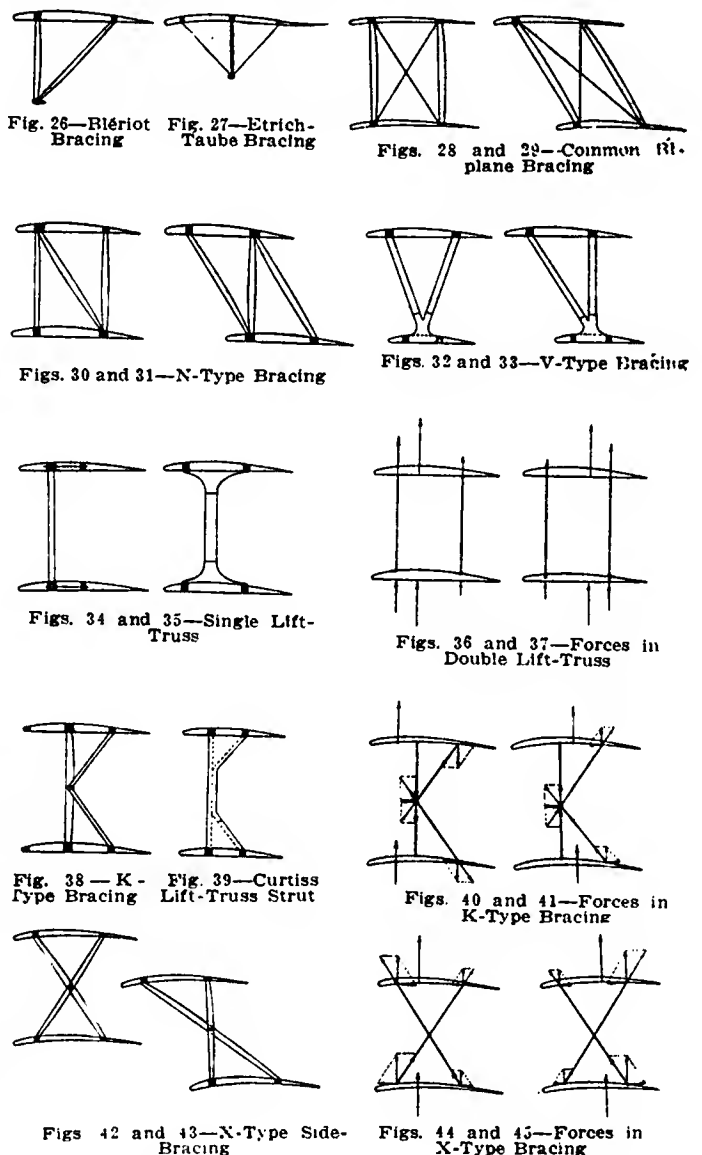
There were and there are few triplanes. The trusses can be treated here along the same principles as the biplane truss.

\*The drift-truss, being enclosed by the wing, does not involve aero-dynamical problems, and can be treated in any desirable way from the structural point of view only. A discussion of it is therefore omitted.

I mention the triplane because in several instances the problem has been treated incorrectly, as shown in Fig. 22, in which the full height of the truss is not utilized, although it would increase the strength of the truss about four times. Figs. 23 and 24 show examples of correct treatment. The triplane has a mechanical advantage of decreasing the buckling length of struts by half, which makes them relatively several times stronger.

Fig. 25 shows a more complicated case of biplane truss for large high-power machines. The more uniform distribution of masses along the truss makes it lighter and stronger. (I omit entirely the question of dynamical stability involved in spreading out the masses in this case.) Here also different solutions are possible. In the Sikorski method the engines *M* are placed on top of the lower wing, close to the inner side of the struts. In the French method the engines are put between pairs of straight struts (see the full lines only). In the Curtiss method the engines are fixed between some special crooked struts (see the dotted lines). Each method has some small advantages and disadvantages, which can easily be seen from the figure.

Until now we have considered only the airplane wing-truss as viewed from the front, or the so-called *lift-truss*. Inside the wings, however, are placed the so-called *drift-trusses*.\* Both the lift and the drift-trusses are combined to form a rigid three-dimension structure by means of bracing in planes passing through the struts and parallel to the plane of sym-



metry of the whole machine. This bracing is visible in the side view of the airplane and I will call it *side-bracing*.

#### Side-Bracing Monoplane Wings

The subject of side-bracing of monoplane wings does not offer anything of remarkable interest. Usually each wing has two parallel or slightly converging spars—the front and the rear spar. Each pair of spars, together with some central pylon or the landing chassis, taken as king post, form the front and the rear lift-trusses. Both are fixed in case of aileron control, and the front-truss is fixed and the rear one movable in case of warping. A monoplane has usually a *double lift-trussing*; the spars are at the same time members of both the lift and drift-trusses.

Fig. 26 shows the side-bracing of the Blériot monoplane-bus, on which the rear spar is braced to the lower girder of the *single lift-truss*. This arrangement is more advantageous than the one on the early type of Etrich-Taube (Fig. 27), because the separate lift and drift-truss (requiring three spars) is uneconomical from the mechanical point of view and the two wires offer about twice as much resistance as the single-strut brace in Blériot's construction. The recent type of Taube has side-bracing similar to that shown in Fig. 26.

#### Side-Bracing Biplane Wings

The side-bracing of biplane wings offers many possibilities of design. The most common types, Figs. 28 and 29, are based on the same principle, but are adapted to the so-called straight and staggered biplane respectively.

The terms "lift-truss" and "drift-truss," although conventional, are not quite correct. None of the trusses takes care of lift or drift alone. Really, the resultant air-reaction upon the wings resolved into components parallel to the planes of the lift and drift-trusses gives the external forces acting on the trusses.

These components differ considerably from the drift and lift, not only in case of a staggered biplane, but also in a straight biplane, in which, for instance, at slow flight and large angle of incidence the forces acting on the drift-truss are frequently opposite in direction to the drift.

Figs. 30 and 31 show the *N-type* side-bracing, with which again the resistance of the wires of the ordinary bracing (Figs. 28 and 29) can be decreased by half. This bracing especially when combined with the wireless lift-truss (Figs. 16 and 17) offers new and interesting possibilities for heavy large-span aeroplanes. It was applied by the Albatross company in the form of a triple lift-truss, which seems to be an unnecessary complication, as simpler combinations are possible.

Fig. 33 shows the *V-type* side-bracing, found in the modern Nieuport scouts. The two converging struts are fixed in a special socket fitted between the spars of the lower wing. This construction is also adaptable to straight biplanes (Fig. 32) but in both cases is especially good for an unequal-chord biplane. Although the trussing in the Nieuport machine is treated as of the double lift type, there is no reason why it (preferably the rear one) could not be treated as a single lift-truss with front struts acting as braces.

#### Development of Single Lift-Truss

The first single lift-truss was used in one of the first Chanute gliders, which was a quintuplane. Chanute, however, did not seem to appreciate the advantages of the single lift-truss system, as he adopted the double lift-truss for his subsequent machines.

It was Bréguet who (1909) produced and advocated the single lift-truss biplane, his main object, however, being to vary automatically the angle of incidence of the wings, which were hinged to the steel tubular spars (Fig. 34).

A more perfect and elegant construction of the single lift-truss, which can be called *I-type* side-bracing, or simply *I-strut*, was used in Dornier's flying boat (1913). The struts,

Fig. 35, were fixed in sockets having long bases that reached from the front spar to the rear spar and were fixed to the latter. An almost identical construction was adopted in 1914 for the R. A. F. fast scouting machine. Mechanically, the front and rear parts of the socket bases can be considered as a cantilever subject to bending, accordingly as the center of pressure moves forward of or past the center of the strut. The struts are thus subject not only to compression but also to bending. The bending moments, however, in the average-size machine are comparatively small and can easily be taken care of by sockets as well as by the struts. In the latter case it is the maximum moment of inertia of the strut-section that comes into play, and the fibers of material affected are almost idle when buckling occurs. Geometrically and aerodynamically the sockets can be treated as a well-filleted inter-section of a strut of streamline section with half of a stream-line body, thus offering little resistance to motion.

#### Advantages of Single Lift-Truss

The disadvantage of the single lift-truss system against the double lift-truss is that it cannot be adopted for staggered biplanes, especially those with a pronounced stagger. The advantages however are great and can be demonstrated as follows:

1. The strength of the struts varies as the moment of inertia of the strut section.

At a constant ratio of diameters of the strut section, the least moment of inertia varies as the fourth power of the thickness (small diameter) of the strut.

Therefore, the thickness of strut varies as the fourth root of the load that the strut can stand.

For the double load of a single lift-truss strut against the two struts of a double lift-truss, the increase of the thickness and therefore of the air-resistance will be only about

$$100 (\sqrt[4]{2}-1) = 20 \text{ per cent,}$$

or the air-resistance will be reduced by about

$$100 \left( \frac{2 - \sqrt[4]{2}}{2} \right) = 40 \text{ per cent.}$$

The weights being proportional to the squares of the thickness, the gain in weight of struts of a single lift-truss against a double lift-truss will be about

$$100 \left( \frac{2 - \sqrt{2}}{2} \right) = 30 \text{ per cent.}$$

2. The diameters of wires or cables vary as the square root of the load that the wire or cable can stand.

For the double load of one single lift-truss cable against two cables of the double lift-truss, the increase of diameter and therefore of the air-resistance will be about

$$100 (\sqrt{2}-1) = 40 \text{ per cent,}$$

or the air-resistance will be reduced by about

$$100 \left( \frac{2 - \sqrt{2}}{2} \right) = 30 \text{ per cent.}$$

There is no gain in weight however in this case.

3. The larger-size wires and cables of a single lift-truss system allow a further gain in reduction of air resistance by using stream-line wires or cables. The latter are made of stream-line form by means of sharp specially-attached trailing edges, which might be impracticable on the small cables of the double lift-truss system.

#### Forces Acting on Each Truss

4. In the double lift-truss system the forces acting on each truss depend upon the position of the center of pressure; at fast flight and a small angle of incidence, the rear truss carries a greater part of the total load—roughly speaking between two-thirds and three-fourths of the total (see Fig. 37). At slow flight and large angle of incidence the reverse is the

(Continued on page 389)

# Orient a Growing Car Market

Increasing Demand Handicapped by Legal Regulations—  
High Freight Rates and Advance Payments by Dealers

By Allen Sinsheimer



**G. M. MALCOLM**  
General manager Oriental branch  
Speyer, Cole & Co., of New York,  
in Singapore

THE NEW—Above—Start of Hupmobile parade from Manila to Antipolo, P. I.  
THE OLD—Below—Method of travelling by carrying-basket, formerly used in the Philippines

THE chief hindrance to American exportation of automobiles to the Orient, according to G. M. Malcolm, general manager of the Oriental branch of Speyer, Cole & Co., New York, in Singapore, S. S., is the demand for cash in advance which manufacturers make upon foreign dealers. Mr. Malcolm's firm is engaged in the exportation of automobiles and the financing of dealers in Asia. They act as traveling representatives for Hupp, Scripps-Booth, Harroun and Roamer cars and Denby trucks for India, Netherland Indies, Java, Sumatra, Borneo, Burma, Ceylon, Federated Malay States, Siam, Japan, Philippine Islands, Korea, China, French Indo-China and the Straits Settlements, and because of a thorough knowledge of Oriental conditions, have secured a large portion of automobile business for these companies.

Dealers in Asia have constantly been hindered by the cash-in-advance demand. This has caused many American manufacturers a loss of business and has aided Mr. Malcolm to sell the machines under his control. Many dealers sell from twenty to forty cars a month. They are frequently forced to wait for delayed freight shipments. Often it is 2 or 3 months following their outlay

of cash in advance before they receive payment for the automobiles from the customers. Consequently they are forced to make cash-in-advance payments upon as many as 120 cars before they receive a return on the expenditure. Speyer, Cole & Co., recognizing the conditions as they prevail, extend financial aid, allowing dealers to pay for cars after delivery, and thus secure business for the cars they handle.

Business throughout the East has been exceedingly prosperous. The Straits Settlements, where tin and rubber are the important products, have been busily engaged supplying nations at war, and the countries where sugar, coffee, tea, tapioca and cocoa are cultivated have had large crops and vast demands for them, which brought financial prosperity, causing an increase in automobile sales.

**High-Priced U. S. A. Cars Introduced**

The war has effected the introduction of American cars of higher prices. Formerly the natives remarked that Americans could make good low-priced cars but that European makers knew best how to manufacture the higher-priced ones. The war has limited the number of European cars for exportation. Fiat is practically the only European maker selling for export demand, and it is now no uncommon sight to witness several Pierce-Arrow cars in the larger cities. Mr. Malcolm believes that this present opportunity should be seized upon by manufacturers of higher-priced automobiles and that they could eventually build a large market for them throughout Asia

The cars now predominating are the Ford, Overland, Buick,

Hupp, Studebaker and Hudson, with Fords in the lead in numbers. At one point between Ipoh and Campur, Mr. Malcolm counted thirty-two Ford cars in a stretch of 32 miles, a number he considered remarkable, as these cities lie on the very end of the Malay peninsula.

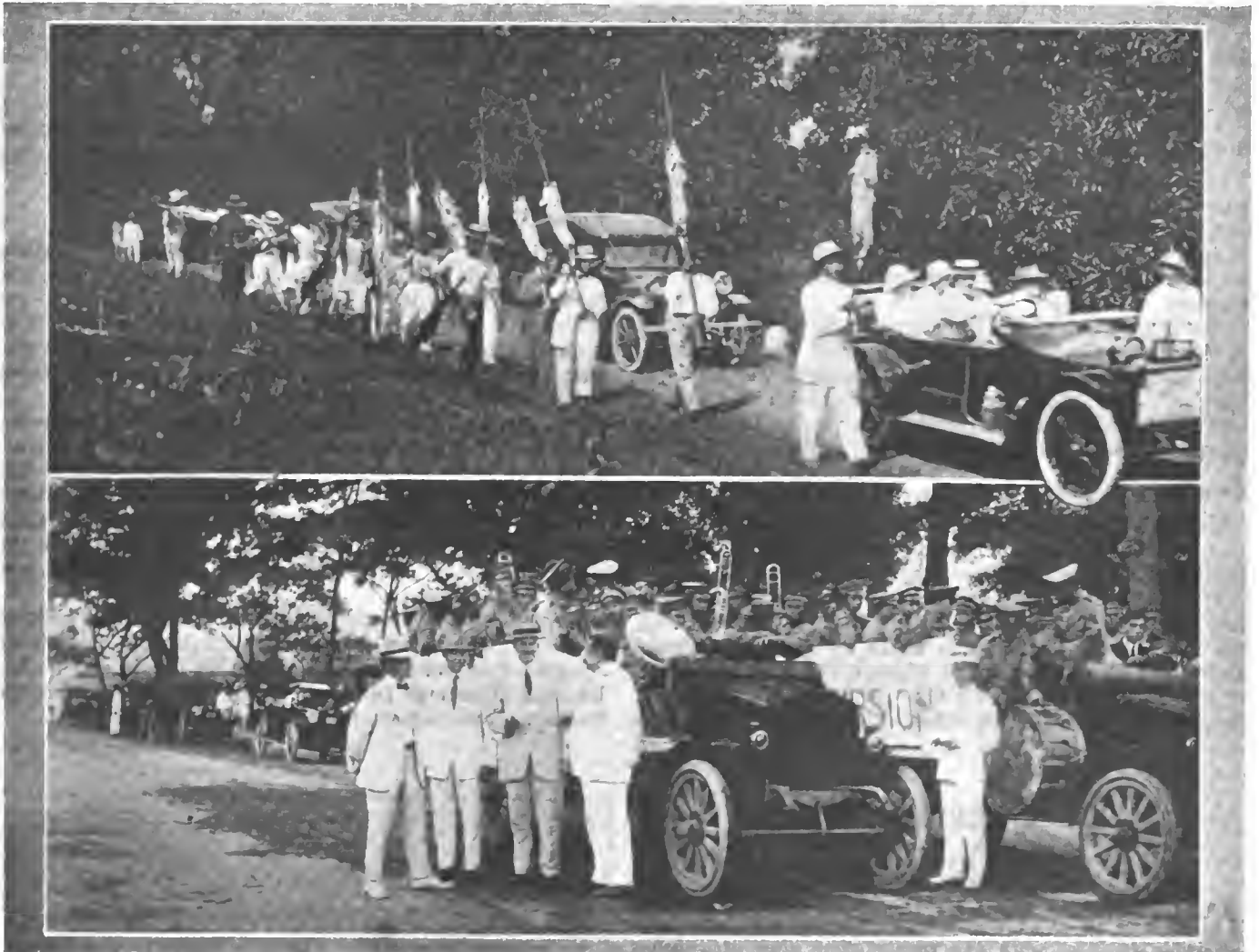
Business increases with good roads. Passable highways are to be found in the Federated Malay States, India, Japan and the Netherland Indies, and the greatest number of cars are discovered there, while the roads of Siam, excepting in Bangkok, and in China are extremely rough and keep automobile sales to a low point. Good road activities have declined since the beginning of the war. Prior to it, the Federated Malay States were engaged in the construction of a number of new highways and that work has been curtailed, while repair and upkeep work which had been maintained throughout India has ceased entirely.

There are a number of strict legal regulations which few American makers follow and this, too, has affected the sale of their products. The Hupp Motor Car Corp., says Mr. Malcolm, has conformed to these regulations and increased its sales by so doing.

**Few Heavy Cars**

There are a few demands for heavy cars but the general call is for five and seven-passenger cars of lighter build. Few two-passenger cars are used. The salary of the native chauffeur is \$12 a month in gold, and as a consequence every-one can afford a driver and prefers a large car. This low cost for chauffeurs has produced the curious effect of taxi-





Above—Parade of natives carrying pigs roasted for guests of Levy Hermanos, Hupmobile distributors in the Philippines. There were 108 Hupmobiles in line and over 500 guests. Below—Two Denby trucks carrying the U. S. constabulary band of 86 pieces from Manila to Antipolo for the Hupmobile celebration. In the foreground from left to right are: Joseph R. Drake, vice-president Hupp Motor Car Corp.; T. Diehl, general manager for Levy Hermanos; R. S. Cole, Oriental sales manager, Hupp Motor Car Corp.; and Leopold Kahn, proprietor of Levy Hermanos

cab rates at \$1.68 an hour, despite the fact that gasoline costs 40 to 45 cents a gallon, and that tires and accessories sell at prices which are double their cost in the United States.

Michelin and Dunlop tires are the predominating foreign casings in use and the Goodyear, Goodrich and United States form the more important American tires that are seen. All accessories are sold by automobile dealers. There are no retail accessory stores separate from the dealers, and the parts business has been neglected to a great extent because here, too, the makers insist on cash in advance. Few public garages exist. Everyone owns his private garage in conjunction with his home.

Freight rates are exorbitant since the beginning of the war. Boats that formerly charged \$10 per ton of 40 cu. ft. now demand \$30, and as a result have almost doubled the cost of parts and cars. Ford touring cars, which require 7 tons of space, cost \$210 for ocean shipment, and Hupp cars, taking 10 tons, are forced to pay \$300. This does not include freight charges in the United States or from the port of delivery, and the five-passenger Ford sells delivered for \$1,750 in native money or \$890 gold.

The majority of the dealers are Europeans. Many Chinamen serve as sub-dealers and are very honest. They have been found to be inefficient organizers, states Mr. Malcolm, but frequently have more money than the white men. The honesty of the Chinamen, he found, is remarkable, and if it were not for his inability to handle a big deal he would

have no hesitation in making them dealers for his cars.

The streets are not as congested in Asia as in America, but each large city has its regulations and traffic officers. Rickshaws are numerous and interfere greatly with the traffic.

Dealers have not specialized in service as in this country and the average car owner is forced to lay up his machine and await parts from America before he can use it following a material injury.

#### Truck Business Growing

The truck industry has expanded in recent years. Trucks may be found in use for loading cargoes, doing public department service, hauling for department stores, and even carrying rubber from the innermost sections of the countries to the coasts. None of the nations or countries in which Mr. Malcolm operates are troubled with winter weather, but all suffer from an extreme moisture which affects tires and batteries and probably causes the great demand for magnetos.

#### Car Dealers Handle Accessories

Accessories are handled by automobile dealers, and there are no separate accessory stores such as exist in the U. S. A.

None of the countries in which Mr. Malcolm travels are troubled by winter weather, but suffer from heavy moisture that affects tires and batteries.

Mr. Malcolm states that many of the demands made by



dealers in connection with certain features to be considered in shipping cars to their territory while in some instances may appear to be foolish requests, have a good reason behind them, and are due to the class of trade to which they are catering.

#### Hupmobile Day

THE AUTOMOBILE is able to present in this issue some very interesting illustrations in connection with Hupmobile Day held in Manila, P. I., on June 25. These photographs give an idea of both city and country roads, and to a great extent portray road conditions as existing throughout all of the territory.

The illustration at the top of page 385 shows the start of the Hupmobile parade from the City of Manila to Antipolo, where the celebration was held, and it will be noted the four types of Hupmobiles which have been introduced into the Philippines during recent years, viz.: model 20, model 32, model K and model N are shown in order.

#### Good Roads in India

Mr. Malcolm is particularly familiar with road conditions in the different parts of his territory. He reports India as having good and extensive road systems.

The Island of Sumatra, which approximates California in area, with 150,000 sq. miles, has fine roads in the Northeast out of Delhi. In the residency of the east coast are tobacco and rubber plantations, one of which is the large plantation of the United States Rubber Co. An automobile can travel from Medan south to Toba Lake. The lake is crossed by a

raft and a new road goes through the interior to the west coast at Padang. In this way a car can cover approximately one half the island. There are good roads from Ben Kolen to the interior.

In Siam there are no roads excepting around Bangkok, a city of 700,000 population. Rice constitutes three-quarters of the total produced in Siam, which is, of course, an English settlement.

#### Kapok Among Java Products

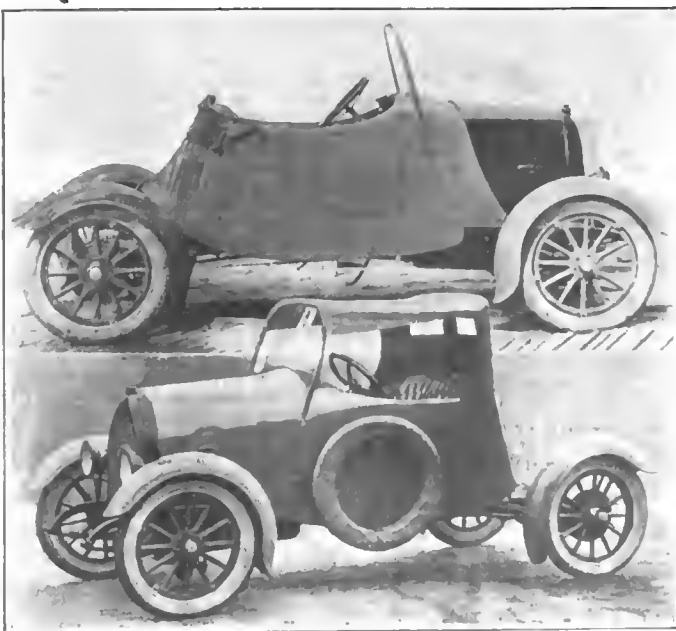
The island of Java, about a quarter the size of Sumatra, has good roads and is reputed as being one of the most productive islands in the world. Last year its sugar crop exceeded that of Cuba. Its other crops are rice, tobacco, tapioca, coffee, tea, cocoa and cinnamon. Kapok, a kind of cotton, is obtained from trees in Java. This cotton cannot be woven but it is used in automobile cushions.

The island of Borneo has very few roads. You can sometimes drive 5 or 6 miles out of such a city as Bandjermassin, a place of 50,000 population. In Borneo the commercial language is Malay. The natives, or dyaks, are the well-known wild men of the island. Some of the products of the island are rubber, rattan and diamonds. From the coast back the island is swampy. There are large oil deposits on the east coast.

Mr. Malcolm gave some conception of the various political divisions. Thus what is known as the Straits Settlements comprise Singapore, Penang, Malacca, the Province of Wellesley, and Christmas Dindings. Netherland Indies comprise Sumatra, Java, Borneo, Celebes, Sondea and Molucca.

## An Unusual Body Design

**R**EALIZING the field for custom built bodies of original design, S. W. Nicholson, Toledo, Ohio, has been doing considerable business with the construction illustrated below during the past year. These bodies, which are made under the name Custom-Built, are fitted to standard chassis, the illustration showing one on the Overland 75. The entire assembly, consisting of radiator, hood, body, fenders, etc., is designed to harmonize with the aim of imparting personality and distinction to the finished car. The manufacturer makes a feature of the low cost of building up cars with the equipment, the price quoted for the car illustrated herewith being under \$1,000.



#### Wilson Truck Wheel Puller

**T**HE novel form of wheel puller, operation of which is illustrated above, is a feature of the Wilson trucks, built by the J. C. Wilson Co., Detroit.

The operation illustrated consists of removing the three bolts holding the hub cap to the hub flange, unscrewing the dust plate in the end of the cap, removing the large nut securing the rear wheel to the axle spindle and again attaching the hub cap with the three bolts. Any 1-in., 9-thread bolt is inserted in the hub cap and screwed against the axle end until the wheel slips off.

# Old and New Transmissions

## Comparing Original Panhard and Renault Gearsets with Modern Types of Unconventional Sort

IT is rather a habit with the authors of papers to be presented before engineering societies to review a whole subject historically, practically writing a small text book upon it. A very interesting paper of this class was recently presented to the British Institution of Mechanical Engineers by Robert E. Phillips. The paper is a very long one and deals briefly with almost every kind of motor vehicle transmission. The illustrations which accompany it are interesting, showing the variations possible in detail without greatly altering the principle.

The author, after reviewing the unmechanical features of the conventional sliding gear transmission, describes the original Panhard and Renault transmissions. The first named was the original sliding gear and the second, the first sliding gear with a direct drive on high. These are shown diagrammatically in Figs. 1 and 2, in this case, as in all the other illustrations, *A* being the driving shaft and *B* the driven shaft. The only sliding member in this gear was the sleeve or lower driving shaft carrying four gears. As shown, the lowest speed is in use. Drawing back the sleeve engages the second gear, further movement gives a neutral position and thereafter follow the engagements of the third and fourth ratios. In the original design there were two bevel pinions on the shaft *B*, both in mesh with the ring gear through which the camshaft and the side chains were driven. Between these bevel gears was a dog clutch and a separate lever enabled this to be engaged with either of the bevel pinions so giving four speeds forward and the same four speeds reversed. Panhard subsequently eliminated this second lever and arranged a reverse pinion somewhat after the fashion of the modern type.

The Renault gear was a considerable advance, although quite complicated. There was a central shaft divided some-

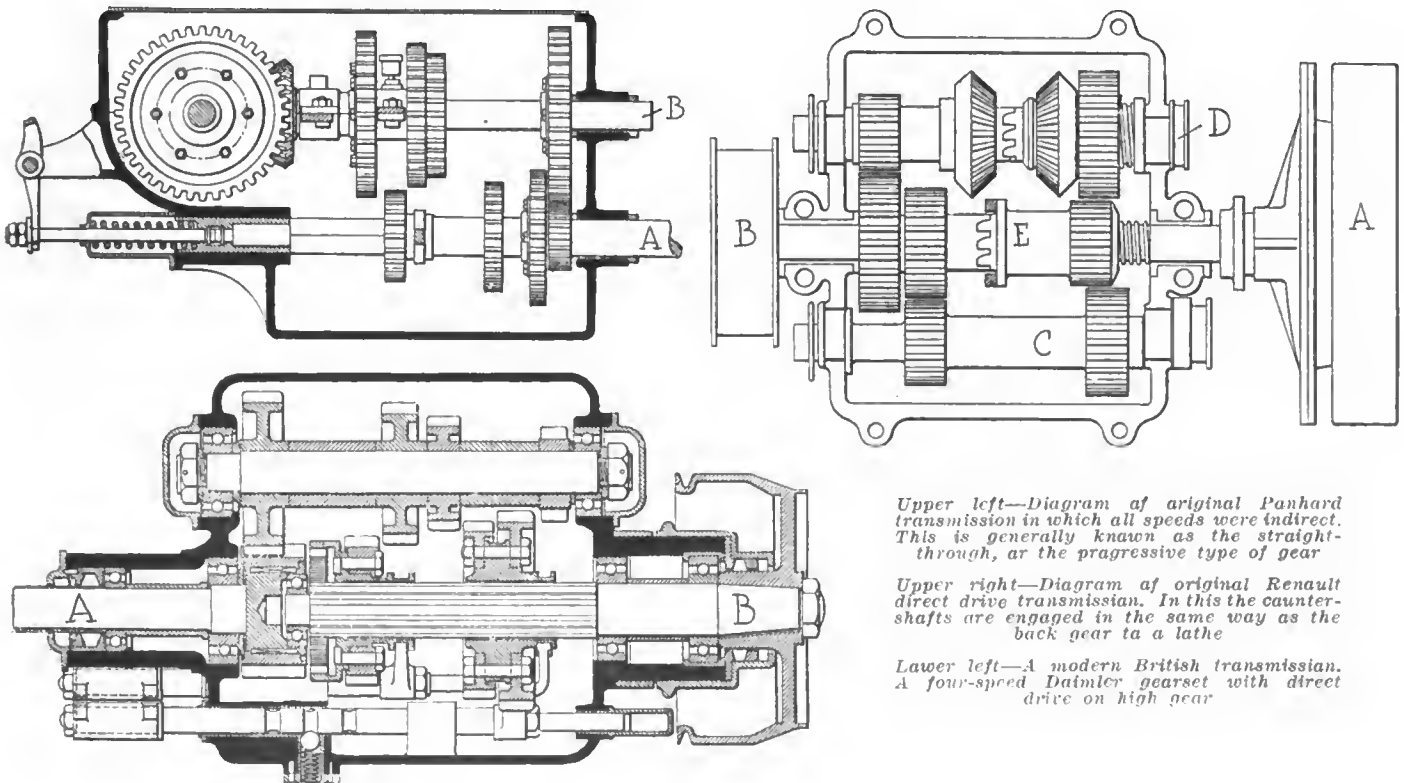
where near the middle. That is to say, the part *A* and the part *B* were independent just as they are in the modern gearset. The sleeve *E* comprised a jaw clutch at the left end, a gear pinion at the right end and behind it was a spring to keep the jaw clutch engaged with the other member which was part of shaft *B*, and, of course, solid with the two pinions at the left end. With *A* and *B* clutched together in this way we have the direct drive and to obtain any other drive the first movement of the control lever opens the clutch holding it open against the pressure in the spring.

Shafts *C* and *D* are mounted on eccentric bushings, these being interconnected so that either shaft can be rolled towards or away from the middle shaft just like the back gear of a lathe. When clutch *E* is disengaged and shaft *C* is rolled over so that the gears on it mesh with the gears on *A* and *B*, the drive passes from *A* through *C* as a countershaft and so to *B* just as in a sliding transmission. Similarly keeping *C* out of mesh shaft *D* can be swung around giving a different gear reduction.

The object of the two bevels seen on *D* is to provide a reverse. The bevels are each integral with the spur gears lying behind them and they are free to rotate on the shaft *D*. Normally they are held together by a jaw clutch between them which is kept engaged by a spring seen at the right end. Under these conditions the set of gearing on shaft *D* provides the low gear.

Mounted separately in the box is a third bevel, pinion, not shown, which can be forced forward so as to mesh with both the bevels on *D*, and in meshing it pushes them apart so disengaging the clutch. This causes the left bevel to revolve in the opposite direction and so provides the reverse gear.

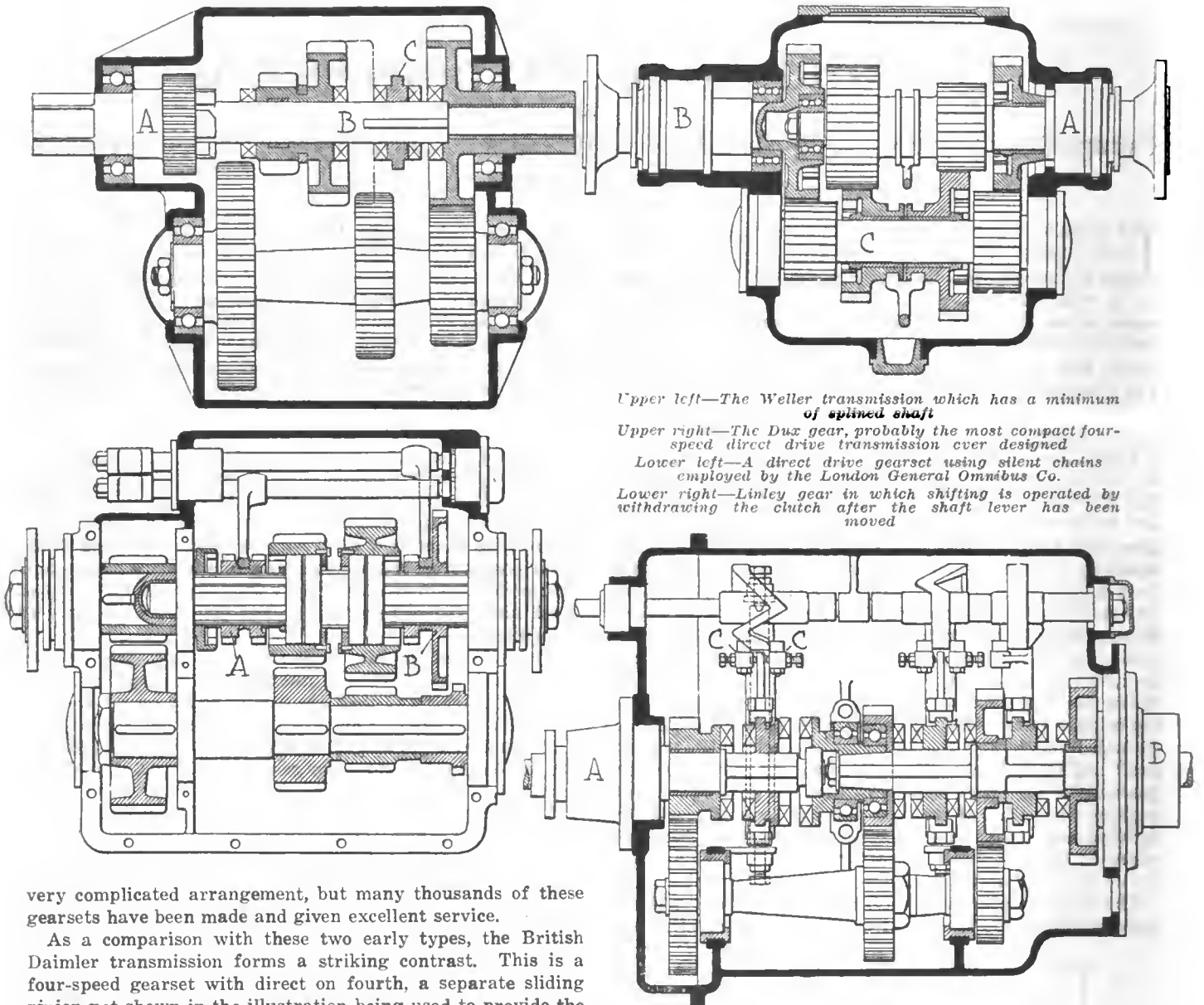
Compared with the conventional transmission, this seems a



Upper left—Diagram of original Panhard transmission in which all speeds were indirect. This is generally known as the straight-through, or the progressive type of gear

Upper right—Diagram of original Renault direct drive transmission. In this the countershafts are engaged in the same way as the back gear to a lathe

Lower left—A modern British transmission. A four-speed Daimler gearset with direct drive on high gear



Upper left—The Weller transmission which has a minimum of splined shaft

Upper right—The Dux gear, probably the most compact four-speed direct drive transmission ever designed

Lower left—A direct drive gearset using silent chains employed by the London General Omnibus Co.

Lower right—Linley gear in which shifting is operated by withdrawing the clutch after the shaft lever has been moved

very complicated arrangement, but many thousands of these gearsets have been made and given excellent service.

As a comparison with these two early types, the British Daimler transmission forms a striking contrast. This is a four-speed gearset with direct on fourth, a separate sliding pinion not shown in the illustration being used to provide the reverse. A feature of this gearset, which is different from conventional American practice, is the great distance between the ball bearings at each end. The idea of course is to give the greatest possible rigidity to the main shafts. It is also noteworthy that no provision is made to relieve the annular bearings of end thrust.

The other gears shown are unconventional designs, all of which, however, have been used fairly extensively in England and have given good service.

The Weller gear has driving shaft A carrying a pinion and a jaw clutch at the left hand end. This shaft passes right through the extreme right end fitting inside a sleeve attached to the gear shown. This sleeve is the driven member, the shaft A ending as shown in the drawing. The two pinions shown at B are quite free on the shaft A, both to slide and to revolve but the double dog clutch C slides on keys or splines and therefore cannot rotate. The countershaft always has its right end pinion in mesh with the driven gear on the sleeve at the upper right to which the propeller shaft is attached. As shown, the gears are in neutral. Moving C to the right clutches shaft A to the end gear and so gives direct high speed. Leaving C where it is and moving B to the right gives the second speed, while moving B left leaving C where it is gives the first speed. It will be seen that all the stress of engagement comes upon the jaw clutches since in whichever direction B is moved its gears are meshed with those on the

countershaft before the clutches interconnect and so before any drive can pass.

The Dux gear is one of the most compact of any. Starting from the driving end A the pinion nearest the right is not attached to the shaft A which is free to rotate. The pinion at the left end is integral with the driven member B and the end of shaft A spigots within it as shown. On shaft A lying between the two gears just mentioned is a sleeve with two pinions. This slides on splines on shaft A. Moving the sleeve to the left causes the larger of the two wheels on it to mesh with an internal ring on the left pinion which is solid with B, so giving the direct drive. Moving the sleeve to the right picks up in similar manner the pinion at the right end, thus clutching this to the driving shaft A. Under these conditions the drive is transmitted to the countershaft C and so to B, just as in the conventional transmission. This gives the third speed.

The first and second speeds are obtained from the sleeves mounted on the countershaft, which are free to turn on the countershaft. These two pinions, which are separate, are each provided with internal teeth enabling them to be clutched to the corresponding pinions which are fixed to the camshaft. Moving the right hand one into engagement gives the lowest speed and the left hand one gives the second speed. The reverse is provided for by independent pinions not shown.

A transmission of an entirely different sort, which was first

designed for the British Commer truck, but has been manufactured for a good many years, is the Linley. This is a constant mesh gear and the various combinations obtained by the use of jaw clutches. It will be seen that the driving shaft *A* is not fixed to the pinion which drives the countershaft. Furthermore, that the gears on the driven shaft *B* are free to turn thereon, but the left extremity of *B* carries half of the jaw clutch which is fixed to it. A double faced jaw slides on splines on the right end of *A* and when this is moved to the right it clutches *A* and *B* solidly together, giving direct high gear drive. The countershaft is brought into operation by moving the clutch out of high gear position and as far as it will go to the left. Then we have the countershaft being driven steadily and can obtain the second and third speeds. The gear seen at the extreme right end is only used for reverse, there being another pinion not shown.

The particular and most ingenious feature of this gear is in the detail of the speed-changing mechanism. The shifter

forks which operate the clutches are mounted on shafts lying transversely across the box (up and down the page in the illustration) and rotation of these shafts which causes movement of the shifter fork is brought about by rotating the shaft *C* at the top of the box bearing peculiarly shaped cams.

The levers connecting the cams with the shifter forks are not rigidly connected with the shaft of the latter, a good stiff spring being interposed. Also the teeth of the jaw clutches are deeply undercut. Suppose now that one of the clutches is engaged and the engine is driving. If we now move the gear shift lever to the position corresponding to the next speed, we shall not be able to withdraw the clutch which is driving, and we shall merely compress the spring. Then as soon as the main clutch is withdrawn or the engine throttle shut the driving effort is relieved and the already compressed spring throws over the jaw clutch picking up the next gear ratio. The driver is thus enabled to select the next gear he wants to use in advance of the time when he desires to use it.

## Aeroplane Wing Trussing

(Continued from page 382)

case, Fig. 36. Thus considering the two extreme attitudes, each of the trusses is either partly idle or has an extra strength and therefore weight.

In the single lift-truss the forces acting on the truss are almost independent of the center of pressure, as the reaction of the load at the root of the cantilever is equal to the load and independent of the bending arm.

Thus, the forces acting on a single lift-truss will be about 25 to 35 per cent smaller than the forces of which the front and rear trusses of the double system must take care in the worst cases. This will result in another considerable reduction of weight and air resistance.

### Special Types of Side-Bracing

Fig. 38 shows a *K-type* side-bracing proposed by Capt. Martin (*Scientific American*, 1911). It is another interesting type of the single lift-truss that has all the advantages mentioned. Besides, as can easily be seen from the action of forces in Figs. 40 and 41, the extra bending moments in the *I-type* strut due to the cantilevers (sockets) are eliminated entirely. This advantage, however, is strongly jeopardized by the extra weight and resistance of the braces.

The Curtiss single lift-truss strut (Fig. 39), which is used in the wireless-truss biplane and in the new triplane (as far as it can be understood from the published details) is built up of two steel tubes, one straight, the other bent in two places; both tubes being inclosed by a covering. The character of cover determines whether this strut should be considered either as of the Martin's *K-type*, without the advantage of eliminating bending, or as a simple and cheaper type of the Dornier cantilever or *I-strut* type.

Finally the *X-type* side-bracing (Figs. 42 and 43) offers also certain advantages, especially as compared with the standard type (Figs. 28 and 29) and even with the *N-type* (Figs. 30 and 31), as it belongs in the double lift-truss class.

The advantage over the *N-type* is that there is one strut less. The advantage over any other double lift-truss system is that the amount of load carried by each truss is practically independent of the variation of the center of pressure, although there is a certain increase of the forces due to the angularity of the struts. (See action of forces in the two extreme cases in Figs. 44 and 45.) The trusses therefore do not have as much extra strength as in all the cases of two parallel lift-trusses.

The gain in resistance and weight is evidently somewhat smaller than in the case of *I-strut*, but in return the *X-type* side-bracing is adaptable to staggered biplanes and to large

big-chord wings. The *I-strut*, and in general the single truss, would offer too many constructive difficulties in these cases.

### Possibilities in Biplane Construction

Numerous interesting and entirely new possibilities in biplane construction can be obtained by combining the types of trusses and side-braces previously described. Examples are:

1. Wireless truss (Figs. 16, 17 or 18) combined with *N-type* bracing (Figs. 30 or 31) can be treated as (a) double lift-truss system or (b) single lift-truss system. In case *b* remarkable results can be obtained by placing the front and rear bars of the *N* in vertical planes parallel to the plane of symmetry of the airplane.

2. Wireless truss combined with *V-type* bracing can also be treated as (a) on a double lift-truss system or (b) on a single lift-truss system.

3. Wireless truss combined with the *I-struts*—an almost ideal structure for small fast machines.

4. Wireless truss combined with the *X-type* bracing, giving a construction with the least number of members for big-span and big-chord machines.

5. Strutless truss (Fig. 20 or 21) combined with the *X-type* bracing, and so on . . . as I do not attempt to exhaust, but merely to indicate the possibilities.



**FRANK E. FITHEN** of Steubenville, Ohio, who lost both arms in a railroad accident when 9 years old and his six-cylinder Oakland speedster. The gear lever is arranged to be operated by the foot and the steering wheel is fitted with a set of six brass rings forming sockets for Mr. Fithen's arm stubs. These changes enable him to handle the car under all sorts of road and traffic conditions.

# Standard Tests for Aeroplanes\*

## Development and Progress in Building Would Be Assisted by Better Testing Systems Better Co-related

By John J. Rooney †

ONE of the most serious questions confronting the aeroplane industry at present is: how can performance predictions be made more reliable? The importance of being able to predict the performance of a design with precision is brought home to us when we are informed that, during the past year, manufacturers have had considerable difficulty in obtaining with their machines the performance guaranteed to the Government in their contracts. This last feature is in itself serious, because it not only means much expense to the manufacturer, but also delay in the delivery of the machines to our Army and Navy, a condition, which, if prevailing during war time, would be a national calamity.

A brief analysis of some of our present methods may throw light on the causes of our trouble and possibly show us a solution of the problem.

The policy of the industry, generally, is to start the development of a new design by doing all the preliminary work in the best approved scientific manner. Laboratory tests are usually conducted with the highest degree of precision and the same scientific thoroughness is carried out in all the engineering work until the actual field testing is done, where carelessness occurs.

### Wasteful Testing

It seems that it is the policy of some of the manufacturers to force successful performance regardless of the number of alterations in design required for the accomplishment. It is my opinion that in this particular we are making a grave mistake. The testing field is nearly always located some distances from the factory and the engineering staff; it is therefore impossible for the engineers to supervise all the changes that are made on the field and investigate the resulting difference in performance. Reliable records of engineering value are seldom kept on the field, and as a result the engineers are deceived regarding the performance of the machine: first, because they do not learn the truth about the performance; and, second, because they have no record of the changes that have been made on the machine to make it come up to expectations—changes often important enough to alter radically the original design.

### Mistakes Repeated

This means that when the next aeroplane is designed the same mistakes are made and the same slipshod field methods are employed in making corrections that would be incorporated in the design if the engineers had accurate information as to their advisability.

We shall now consider some of the ways in which an aeroplane's performance can be affected. Two conditions affecting performance that are more or less uncertain and are capable of wide variations are the weather and the skill of the pilot. The effects of varying weather conditions are obvious. The effect of the personal equation can best be shown by citing actual conditions. The low speed of an aeroplane varies inversely as the magnitude of the angle of attack (that is, for all fling angles), therefore, the higher the angle,

the slower the speed. By being able to take advantage of this peculiarity a skillful pilot can land a machine at a lower speed than can an amateur. The skillful pilot can also obtain a higher maximum speed and a better climbing rate by being able to take advantage of other similar peculiarities.

The speed of an aeroplane is a function of the wing shape and loading and is due to the thrust overcoming the resistance. The power developed by the engine depends on a number of different conditions. The performance of the propeller also depends on several variables. Therefore, since the performance of an aeroplane can be affected by so many variables it is preposterous for us to think we can continue conducting field tests in an unscientific way and at the same time make progress as rapidly as we should.

### Standardize Field Test

What I have to suggest is that we standardize field tests as much as possible. The automobile engineers have found it necessary in the development of their engines to have a complete record of all the changes they make in design and the effect they have on the engine's performance. As a result, they can predict with a high degree of accuracy the result of this or that change. In order to facilitate the recording they have evolved standard forms that contain all the important data they desire to record. Since they have already accomplished much by these methods, and since we are striving to do the same, we should profit by their experience and conduct our tests in the same scientific manner.

It would seem that the sheet proposed for the S. A. E. Engine Testing Forms would be satisfactory for giving the engine specifications.

Our sad experience in Mexico last summer is enough to show the importance of knowing the conditions under which machines are to be flown. We should have reliable data on the climate and soil of every section of the United States, as these two conditions may at some time completely determine the design.

### More Science Wanted

At present performance tests cannot be conducted as scientifically as we hope they will be in the future, owing to lack of proper instruments. The present instruments are nearly all non-recording, and are usually separate, which means that simultaneous readings are impossible. In some work, particularly in propeller designing, it is necessary to know the simultaneous velocity of advance, revolutions per minute and power absorbed. If correct values of these quantities are not known propeller designing is mere guess work.

An ideal arrangement of the instruments would be to mount them in one case and have one clock operate a recording device. If such a combination is not practical we should at least try to develop a recording air-speed indicator and tachometer, if for nothing more than to check our propeller computations.

Performance predictions can be made more reliable by satisfactorily checking our laboratory experiments with actual field tests. Whether we use the plan outlined above, or some other to furnish that check, let us by all means increase the value of our field tests.

\*Paper presented at the First Aeronautic Session of Society of Automobile Engineers.

†Wright-Martin Aircraft Corp.

# ACCESSORIES

## New So-Luminum Compound

**A** WELDING compound that will mend defects in sheet or cast aluminum or build on new parts by the use of a gasoline torch has been brought out under the So-Luminum name. The repaired parts can be subjected to boiling water or steam without damage, it is stated. The compound also joins aluminum to copper and brass, making a joint stronger than the aluminum. No flux is required when using this compound. Another advantage in being able to use a gasoline torch for mending aluminum is that the metal is not weakened nor made brittle, while castings do not warp or fail to line up.—So-Luminum Mfg. & Engineering Co., 1790 Broadway, New York.

## P. S. E. Plug Energizer

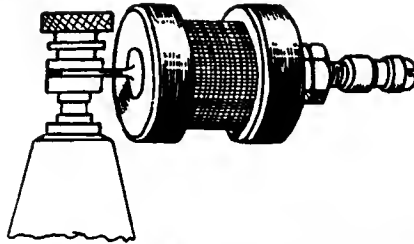
This device provides an auxiliary spark gap in the secondary circuit for the purpose of increasing the intensity of the spark. It is inserted between each spark plug terminal and the end of its secondary wire, and comprises a fiber frame holding the two electrodes forming the gap, all inclosed in a wire gauze case. The spark is visible and is claimed to be much hotter. Price, \$1.—P. S. E. Mfg. Co., 1777 Broadway, New York.

## Varni-Shine

Varni-Shine is intended for cleaning and preserving the car finish. It is claimed to remove grease and dust and to impart a high finish. Price per half gallon, \$1.75; per quart, \$1; per pint, 50 cents.—Varni-Shine Co., Columbus, Ohio.

## Bradford Gloves

Two styles of driving gloves are made by this company. The first, No. 916, combines two gloves in one, the plan being that the outer covering can be used independently as a lighter weight glove, if so desired. The inner lining is of stocking knit wool with a close-fitting wrist,



P. S. E. spark plug energizer for increasing the intensity of the spark



Two Bradford gloves, the lower having detachable woolen lining



Thermo-Kor manifold for Fords, which heats the incoming mixture

over which is fitted a complete leather glove made of washable cape. The other glove, No. 1906, is a full fashioned sporting gauntlet made of washable cape. It has no seams at the wrist and is held by an elastic band. The lining is double-weight stocking knit. Price, No. 916, \$4; No. 1906, \$6.—R. E. Bradford, Gloversville, N. Y.

## Thermo-Kor Heated Manifold

A special manifold for Fords in which the incoming mixture is heated by the exhaust gases. A hollow cord is cast integrally with the manifold and is piped to the exhaust, permitting the exhaust gases to pass through the center of the manifold. The performance of the motor in cold weather is bettered, it is claimed. Price, \$4.—Clark Gas Power Co., Herkimer, N. Y.

## Temco Tool Bag

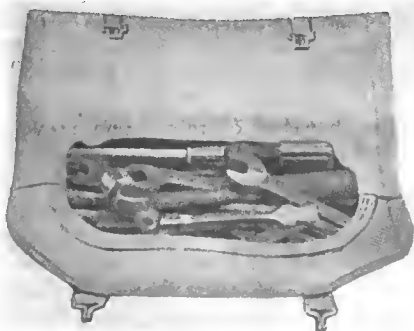
This is a cotton-duck fabric tool bag for the repairman or driver. Tools are all carried in one compartment having a large opening in the side, thus rendering the tools readily accessible. This opening is closed by a large flap held by two snap clasps, that permits quick opening and closing. The bag is carried by a heavy canvas handle. Price, \$1.25.—Temco Electric Co., Leipsic, Ohio.

## Stewart Handy Worker

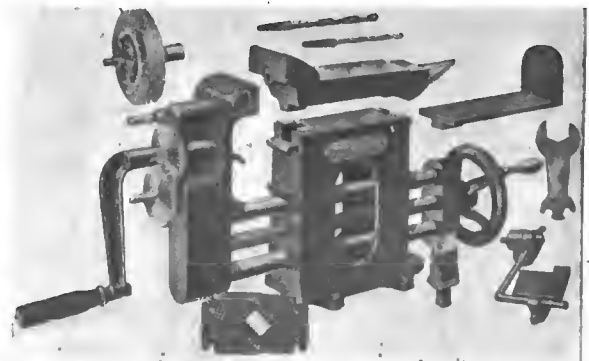
The Handy Worker is a bench fixture combining six machine tools in one. It comprises a two-speed drill press, grinding outfit, powerful vise and pipe vise, metal cutter and a sturdy three-speed machine for attaching and operating emery wheels, scratch wheels and buffing wheels. The weight of the outfit, boxed for shipment, is 90 lb. Price, \$12.50.—Chicago Flexible Shaft Co., La Salle and Ohio Streets, Chicago.

## Insyde Tyre

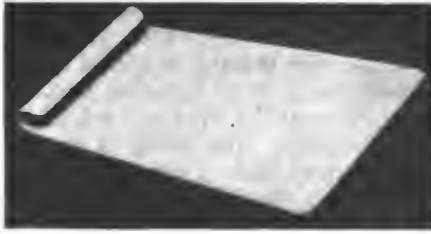
This is a fabric reinforcement inserted between the inner tube and the casing. Several layers of tough fabric are vulcanized together over a tire mold and shaped to fit the inside of the casing. The Insyde Tyre has much the appearance of a casing with the tread and rims removed, made slightly smaller that it may fit the casing without wrinkles. The



Temco tool bag, open and closed, showing compactness and method of carrying



The Stewart Handy Worker combines six tools in one machine for attaching to the work bench



Combination shovel and jack base to provide level jack footing

outer surface is coated with cement, which vulcanize itself to the casing and prevents slipping. It is claimed that the use of the reinforcement will prolong the life of a tire from 1000 to 5000 miles. Prices, 3 in., \$4; 3½ in., \$4.75; 4 in., \$5.75; 4½ in., \$7.25; 5 in., \$9. The above prices refer to diameter of tire section, and do not mention wheel diameter. A 4-in. Insyde Tyre will fit 32 by 4, 33 by 4, 34 by 4 and other 4-in. sizes.—American Automobile Accessories Co., 621 Main Street, Cincinnati, Ohio.

**Shovel and Jack Base**

Combining use as a shovel to prepare a level footing for a jack on a rough road and as a flat base beneath the jack, this device is made of heavy galvanized steel, weighs 1½ lb., and measures 9 by 6 in. It is claimed to be particularly useful in replacing wire wheels, as a secure jack base is essential. Price, 50 cents.—Laconia Car Co., 60 Congress Street, Boston.

**F. & R. Car Vise**

This vise is of the swiveled-base type, with a clamp for attaching to the running board of a car. The jaws are steel-faced and tempered, 2 in. in width, and may be opened 2 in. The weight is 7½ lb., and the construction very compact, permitting the vise to be carried beneath the rear seat. This vise can be adjusted to any position, and both swivels are locked when the work is clamped between the jaws. Price, \$8.50.—Fulton Machine and Vise Co., Lowville, N. Y.

**Safety Radiator Emblem**

This radiator emblem bears the words "Safety First" in raised white enamel letters on a medium green background, this shade being the official color of the Safety First organization. The rim and base of the emblem are of polished nickel, and it may be attached to any radiator cap. It sells for 75 cents.—Stevens & Co., 375 Broadway, New York.

**Honn Babbitting Jig**

This jig is designed for babbitting connecting-rods and also for determining the true alignment of the two pins. A metal base carries two fixed uprights holding the crankpin bushing, and adjustable V-block carrying the wristpin bushing. Four shafts and eight collars are furnished to fit various sizes of connecting-rods, the piston pin being used for the



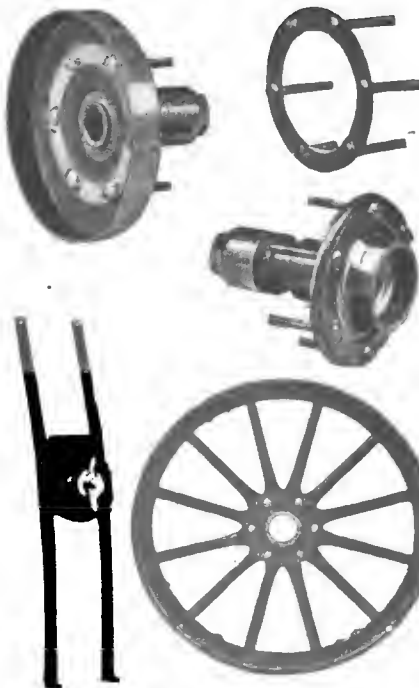
F. & R. car vise for attaching to the running board. It is adjustable



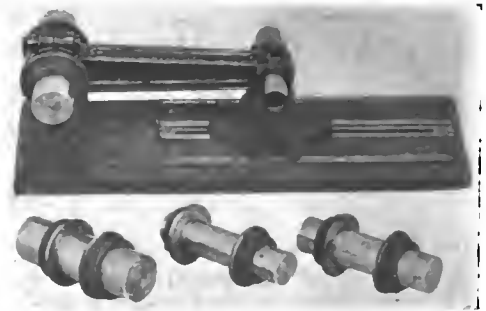
Safety First emblem for mounting on the radiator



Hand signal lamp which is secured to the hand by an elastic band



Details of Simplicity demountable wheel for Ford cars



Honn Babbitting jig. This device is also useful for aligning bearings

upper end of the rod. All parts are made very accurately and permit the jig to be used for obtaining true alignment of the pins. Price, babbit jig, \$9; furnace, \$2; ladle, 75 cents; blowtorch, \$4. Set complete, \$15.—Honn & Son, 578 Stocking Avenue, N.W., Grand Rapids, Mich.

**Hand Signal Lamp**

This electric lamp makes the extended hand of the driver a conspicuous signal at night. It is held to the back of the hand by an elastic and receives current from the dash socket. The lamp is 2 cp., and is held in a nickel case 2 in. in diameter, 1 in. thick, with a ruby bull's-eye 1 in. in diameter. As very little current is required, the lamp is left lighted.—Pittsburgh Electric Specialties Co., Pittsburgh, Pa.

**Simplicity Demountable Wheel**

For providing a quick wheel change for Ford cars special hubs are placed on the axles, these hubs having projecting bolts to which the Ford wheels are readily bolted or removed. The installation requires that the wheels be removed, the special hubs substituted and an inner flange bolted to the inside of the wheels to take the place of the hubs removed. An extra wheel, a side carrying bracket and all tools for the change are included. It is said that the change may be made in 4 min. The device sells for \$15, complete.—Simplicity Demountable Wheel Co., Grand Rapids, Mich.

**Perfection Motor Robes**

Perfection motor robes are made of black plush with black Russian bear cub lion, and in other styles to suit. Three stock sizes 48 by 60 in., 54 by 66 in., 60 by 70 in., are offered.

The construction of these heavy fur-lined robes is said to be so exceptionally durable that the complete line is very well suited to the automobilist's requirements. Lockstitch sewing, turned fur edges, reinforced borders, and selected fur skin, are some of the features. Also each robe carries a metal identification tag, the number being registered with the makers, facilitating recovery if lost.—Perfection Robe Co., 12 South Market Street, Chicago.

# Industrial Miscellany

## Factory

Ford Motor Co. will increase its output at the Milwaukee plant from 90 to 135 cars daily. The maximum capacity of this factory is 180 cars per day.

Menominee Motor Truck Co., Menominee, Wis., has been invited to move its plant to Green Bay, Wis., by the business men of the latter city who are raising a guaranty fund of \$125,000 to effect the removal.

Auto Specialty Co. will commence production at St. Joseph, Mich., shortly. The company recently moved its plant, with 330 workers and their families, from Joliet, Ill.

McIntyre Co., Chicago, manufacturing the Famous commercial truck, is looking for a location in some inland city of Illinois or other state adjacent to Chicago. A factory site is sought which has adequate railroad facilities.

Herschell-Spillman Co., North Tonawanda, N. Y., will occupy the major part of its new factory building within the next 2 weeks.

Allen Motor Co., Fostoria, Ohio, is laying out building sites and streets for the workers at its new factory expansion on the outskirts of the city. The automobile community planned will be known as Allendale Addition.

Vassar Stamping Works has been incorporated for \$31,500 at Vassar, Mich., to manufacture automobile parts. J. E. Faber, R. A. Crowbar and Q. J. Spear are the incorporators.

Turner Mfg. Co., Port Washington, Wis., manufacturer of gasoline engines and power farm machinery, is now producing tractors. Orders for more than 1000 machines are on the books.

Dundore Mfg. Co., Reading, Pa., has been incorporated at \$75,000 to make automobile parts and accessories. The incorporators are Charles S. Dundore, Edwin Smith, W. Stewart Wray, and D. Elmer Worley.

Beaver Dam Casting Co., Beaver Dam, Wis., has been organized with a capital stock of \$10,000 to lease the plant of the former Gray Iron Foundry Co., Beaver Dam, and specialize in cast and

semi-steel for the automobile and engine trade. The company now employs between 125 and 150 men.

Ladish Drop Forge Co., Cudahy, Wis., is rushing work on a large shop addition. The company produces cranks, camshafts, and other automobile parts.

The Kerosene Motor and Tractor Co., St. Louis, has been organized to sell the Peoria and Parrett tractors. The new company is a subsidiary of the Weber & Damme Wagon Co.

## Personals

Andrew Langerbacher has been appointed sales manager of the Duplex Truck Co., Lansing, Mich. He was formerly with the sales department of the Reo Motor Car Co.

H. E. Heimberger has been appointed assistant manager of sales of the automobile department of the Vacuum Oil Co., Indianapolis, to succeed C. B. White, who has been promoted to the superintendency of the company's branch at Des Moines, Iowa.

## The Automobile Calendar

### CONTESTS 1917

- April—Los Angeles to Salt Lake City Road Race.
- May 19—New York Metropolitan Race on Sheephead Bay Speedway.
- May 30—Indianapolis Speedway Race, Championship.
- June 9—Chicago, Ill., Speedway Race, Championship.
- June 23—Cincinnati, Ohio, Speedway Race.
- July 4—Omaha, Neb., Speedway Race, Championship.
- July 4—Tacoma, Wash., Speedway Race, Championship.
- July 14—Des Moines, Iowa, Speedway Race, Championship.
- Aug. 4—Kansas City Speedway Race.
- Sept. 3—Cincinnati, Ohio, Speedway Race, Championship.
- Sept. 15—Providence, R. I., Speedway Race, Championship.
- Sept. 29—New York, Speedway Race, Championship.
- Oct. 6—Kansas City Speedway Race.
- Oct. 13—Chicago, Speedway Race.
- Oct. 27—New York Speedway Race.

### SHOWS

- Feb. 7-15—Chicago Cement Show, Coliseum, Cement Products Exhibition Co.
- Feb. 10-17—Harrisburg, Pa., Harrisburg Automobile Dealers' Assn., J. Clyde Myton, Mgr.
- Feb. 10-17—Hartford, Conn., Show, State Armory, First Infantry.
- Feb. 10-18—San Francisco, Cal., Pacific Automobile Show, G. A. Wahlgren, Mgr.
- Feb. 12-17—Bay City, Mich., Show, Armory.

- Feb. 12-17—Kansas City, Mo., Second Annual Tractor Show, Union Station Plaza.
- Feb. 12-17—Kansas City, Mo., Kansas City M. C. Dealers' Assn.
- Feb. 12-17—Louisville, Ky., Show, First Regiment Armory, Louisville Automobile Dealers' Assn.
- Feb. 12-17—Toledo, O., V. G. Kibby, 1017 Jefferson Ave.
- Feb. 12-19—Indianapolis, Ind., Show, Steinhart Bldg., Indianapolis Automobile Trade Assn.
- Feb. 13-15—Grand Forks, N. D., Auditorium, Automobile Dealers' Assn.
- Feb. 13-17—Williamsport, Pa., Armory, John Kelly, Mgr.
- Feb. 14-17—Peoria, Ill., Coliseum, Automobile and Accessory Dealers' Assn.
- Feb. 15-17—Racine, Wis., Chas. A. Myers, Mgr.
- Feb. 17-24—Albany, N. Y., Sixth Annual, State Armory, Albany Automobile Dealers' Assn.
- Feb. 18-25—St. Louis, Mo., Show, Automobile Manufacturers' and Dealers' Assn.
- Feb. 19-24—Springfield, Ohio, Show, Memorial Hall, Springfield Automobile Trade Assn.
- Feb. 19-24—Pittsfield, Mass., Show, Armory, J. J. Callahan, Mgr.
- Feb. 19-24—Portland, Me., Exposition Building.
- Feb. 19-24—Grand Rapids, Mich., Show, Automobile Business Assn. of Grand Rapids.
- Feb. 19-24—Duluth, Minn., Show, Duluth Auto Dealers' Assn., Armory.
- Feb. 19-24—South Bethlehem, Pa., Show, Coliseum.
- Feb. 19-24—Bridgeport, Conn., Show, Armory, Coast Artillery Corps.

- Feb. 19-24—St. Louis, Overland Bldg., St. Louis, Auto Dealers' Assn.
- Feb. 19-24—Syracuse, N. Y., Show, State Armory, Syracuse Dealers' Assn.
- Feb. 19-24—Pittsfield, Mass., J. J. Callahan, Mgr.
- Feb. 20-24—Salt Lake City, Utah, Inter - Mountain Automobile Show, Bonneville Pavilion, W. D. Rishel, Mgr.
- Feb. 21-24—New London, Conn., Armory.
- Feb. 21-24—Flint, Mich., Coliseum, Lake Side Park, E. W. Jeffers, Mgr.
- Feb. 21-24—Trenton, N. J., Armory, Trenton Automobile Trade Assn.
- Feb. 24-Mar. 3—Newark, N. J., Show, First Regiment Armory.
- Feb. 24 - March 3—Brooklyn, Show, 23rd Regiment Armory.
- Feb. 24-March 3—Atlanta, Ga., Automobile Dealers' Assn., Auditorium.
- Feb. 26-March 3—Great Falls, Mont.
- Feb. 26-March 3—Omaha, Neb., Show, Auditorium, Omaha Automobile Show Assn.
- Feb. 26-March 3—Utica, N. Y., Utica Automobile Dealers' Assn., State Armory.
- Feb. 26-March 3—Wilkes-Barre, Pa., Hugh B. Andrews, Mgr.
- Feb. 27-March 4—Atlanta, Ga., Show, Auditorium, Atlanta Auto Trades and Accessory Assn.
- March 1-2, 3—Urbana, Ill., Show, Automobile Trade Assn. of Campaign Co., Armory of the University of Ill.
- March 3, 4, 5—Green Bay, Wis., Show, Green Bay Automobile Dealers' Assn.
- March 3-10—Boston, Mass., Show, Mechanics' Bldg., Boston Automobile Dealers' Assn.
- March 3-10—Washington, D. C., Middle Atlantic Motor Assn., Inc., Union Bldg.

- March 5-10—Jamestown, N. Y., Jamestown Automobile Dealers' Assn., Armory, C. A. Hanvey, Mgr.
- March 5-12—Birmingham Ala., Auditorium.
- March 6-9—Fargo, N. D., A. Hanson, Mgr.
- March 6-10—Fort Dodge, Iowa, Northern Iowa Show, New Terminal Warehouse, G. W. Tremain, Secretary.
- March 7-10—St. Joseph, Mo., Auditorium, St. Joseph Automobile Show Assn.
- March 12-17—Vancouver, B. C., British Columbia Automobile Assn., Horse Show Bldg.
- March 13-16—Fargo, N. D., Armory and Auditorium.
- March 14-17—Mason City, Ia., Armory, Mason City Automobile Dealers.
- March 14-17—Davenport, Iowa, Show, Coliseum Bldg., Tri-City Auto Trade.
- March 17-21—Manitowoc, Wis., F. C. Borchardt, Jr., Mgr.
- March 17-22—New Haven, Conn., Show, Hotel Taft.
- March 17-24—Pittsburgh, Pa., Motor Square Garden, J. J. Bell, Mgr.
- March 18-23—Cedar Rapids, Ia., Cedar Rapids Automobile Trades Assn.
- March 19—Paterson, N. J., Sixth Annual, Auditorium, R. A. Mitchell, Mgr.
- March 21—Trenton, N. J., Second Regiment Armory, J. L. Brock, Mgr.
- March 27-31—Deadwood, S. D., Fifth Annual, Deadwood Auto Show, J. E. Nelson, Mgr.
- March 31-Apr. 14—Atlantic City, Garden Pier, S. W. Megill, Mgr.
- April—Calumet, Mich., Show, Coliseum, Frank Ketchell, Mgr.
- Apr. 4-7—Stockton, Cal., Second Annual San Joaquin Auto Trades Assn., Samuel S. Cohn, Mgr.
- Sept. 2-9—Spokane, Wash., Interstate Fair.



C. T. Bird has been appointed vice-president and works manager in charge of engineering and production of the Pangborn Corp., Hagerstown, Md. He resigned from the Mott Sand-Blast Co. Jan. 1. He was sales engineer for Pangborn, which makes sandblast and allied equipment, some years ago.

A. E. Morrison has accepted the position of Western sales manager for the Rainier Motor Corp., Flushing, N. Y. He has been with the past 4 years with the Maxwell company.

W. H. Barcus will manage the new Cleveland district for the Fisk Rubber Co. This includes Toledo, Lima, Columbus, Youngstown, Dayton, Cincinnati and Pittsburgh. Mr. Barcus has been manager of the old Cleveland Fisk district.

R. D. Northrup has joined the sales staff of the Greenleaf Co., Boston. He was formerly advertising manager of the Standard Woven Fabric Co.

Harry A. Stevenson has decided to devote all his time to the Michigan State Auto School as vice-president. He has been interested in the institution for some time, and has been allied with the Detroit Electric Co.

F. A. Snow is now in business for himself as a consulting metallurgist, with headquarters in Chicago. He is planning to establish a commercial heat-treating plant there. He left his position as chief metallurgist of the Thomas B. Jeffery Co., Kenosha, Wis., on Feb. 1.

M. C. Manship has been appointed manager of the Philadelphia branch of the Maxwell Motor Sales Corp. He was formerly with the New York branch.

H. J. Newman has taken a position in the sales department of the Garford Truck Co., Lima, Ohio. He was formerly assistant sales manager of the Atterbury Motor Truck Co.

J. W. Clower has been made sales manager of the Bush-Morgan Motor Co., Kansas City, Mo., distributors of Paige and Dort. Mr. Clower has been salesman with the firm for a year.

Samuel L. Chorlines, St. Louis, recently with the United States Tire Co., has been made manager of the Independent Tire Co., that city.

L. C. Parrott has taken the position of purchasing agent of the Otis Steel Co., Cleveland. He formerly held a similar office with the Standard Parts Co.

Dan F. White has been appointed southern district manager for the Firestone Tire & Rubber Co., Akron, Ohio.

O. O. Dice has joined the sales force of the Cuyler Lee organization of San Francisco as sales manager of the Maxwell branch of that company.

L. Z. McKee has been appointed manager of the Gibson Co. branch house at Lafayette, Ind. Mr. McKee has been with the Gibson organization for several years.

D. V. Kennedy, formerly the sales manager for the Candler Radiator Co., Detroit, has been appointed manager of the Detroit branch of the Perfex Radiator Co., Racine, Wis.

Robert F. Black, formerly with the factory of the International Motor Company at Allentown, has been made manager of the Philadelphia branch, handling Mack and Saurer trucks.

F. Finch will have complete charge of the retail sales of the Overland company's Winnipeg, Man., branch.

D. J. O'Keefe, formerly sales manager in Texas for the General Roofing Co., has become sales manager for the Harry Newman, Inc., of St. Louis.

F. P. Fentress of Seattle has taken the Western Washington agency for the Peerless cars and trucks.

George C. Newell has been appointed western Washington agent for the Savage Tire Co. of California.

Louis Logie and Louis Livingstone have been appointed general sales manager and eastern Canadian manager respectively of the Maxwell Motor Co. of Canada, Ltd.

R. D. Oilar and W. M. Edwards, of Indianapolis, will handle Crow-Elkhart for Indianapolis and Marion counties.

L. A. Poundstone has succeeded C. B. McLaughlin as manager of the Maxwell branch at Kansas City. Mr. Poundstone was formerly at the factory.

E. M. Marcus has been made assistant to the treasurer and manager of the auditing and public accounting divisions of the Wallace C. Hood Service Bureau, Detroit.

J. E. Breakey, of the purchasing department of the King Motor Co., Detroit, has been promoted to the position of cashier and office manager of the company.

## Dealers

Federal Rubber Co., Atlanta, Ga., branch has been opened. E. L. McCaffrey, formerly manager of the Philadelphia branch, is in charge.

Hubbel-Oakes Motor Co., Atlanta, Ga., has added the Commerce trucks to the line of passenger cars. The company has the State agency.

Willys-Overland Co. has opened a used car department in Atlanta, Ga. Frank North is in charge.

Blount Carriage & Buggy Co., Atlanta, Ga., will sell the Woods Dual Electric Cars.

Anderson Motor Sales Co., Birmingham, Ala., has taken over the agency for Briscoe cars from P. J. Macalpine. The Anderson Co., of which J. A. Carr is president, will handle Mack trucks.

Geo. A. Morse, Inc., Minneapolis, has succeeded to the Tri-State Automobile Co. It thus acquires the Northwestern distribution of the Inter-State car. The St. Paul agency has been taken by the Oldsmobile Co., 343 N. Exchange Street.

D. W. Young Motor Car Co., Atlanta, Ga., has opened a salesroom and service station in Montgomery for Packard cars. I. Griffith of Birmingham, will be in charge at Montgomery.

P. J. Durham Co. New York employees will participate this year in the earnings of the company figured on a basis of 5 per cent of the total compensation received by each one during the past year. This company gives service on Gray & Davis, Electric Auto-Lite and Willard Electric systems.

International Truck Sales Co., selling agents for the I. H. C. truck, Kansas City, Mo., has moved from the West Bottoms implement district to Motor Row.

Larabee-Deye Truck Co., of Binghampton, N. Y., will soon have an agency in Kansas City, under the management of B. F. Hanna.

Bates Steel Mule Tractor Co.'s agency at Kansas City, Mo., has moved to 1708 Grand Avenue. C. H. Bently is sales manager.

Topeka Buick Co., Topeka, Kan., has bought property and will build to secure 100 per cent more floor space.

Dougherty Motor Co., Kansas City, Mo., will have the Allis-Chalmers tractor at its headquarters, following an arrangement with A. L. Palmer, who has had charge of Allis-Chalmers tractors in this territory.

Buxton-Phillips Motors Co., Kansas City, Mo., has incorporated, \$10,000 paid, and opened a Chalmers agency. Incorporators are H. G. Kirkland, Kirkland-Daley Motor Co., sales agency of Studebaker; F. D. Phillips, formerly wholesale sales manager of the Willys-Overland, Kansas City, and L. A. Buxton, formerly salesman, Kirkland-Daley Motor Co.

Seattle Motor Car Dealers' Assn. elected the following officers at its annual meeting in the Arctic Club building: A. G. Schaefer, president; William L. Eaton, vice-president; J. A. Osmond, secretary; M. S. Brigham, treasurer, and F. L. Rockelman, trustee.

United Tire Co. has opened a branch in Seattle, which will handle the territory of Oregon, Montana, Idaho, Alaska, British Columbia and Washington.

J. W. Leavitt Co., of California, has taken the Pacific Coast agency for the Harroun car. The company has until recently been the Coast distributor for the Overland car.

H. W. Moore & Co. of Denver, Billings, Mont., and Salt Lake City, has been named as distributor in the west for Ohio trailers, made by the Ohio Trailer Co., Cleveland.

L. M. Cotton, Inc., has been appointed New England representative of Ohio trailers.

E. Edelman & Co., Chicago, has established offices, a sample room, and stock room at 119 West 42nd Street, New York, in charge of A. R. Klein. A complete line of Edelman accessories will be carried at this office.

Mall Motor Co. has been incorporated at Columbus, Ohio, to distribute Ford cars for this district. The incorporators are: W. C. Malin, J. A. Cline, and M. A. Patterson, all of Columbus.

Tritt & Gockley, Canton, Ohio, have been appointed distributors for Amazon Tire & Rubber Co. products with exclusive selling rights in Stark and Tuscarawas counties.

Sun Motor Co., of Philadelphia, has been formed to handle the Sun car. The company has located at 514 North Broad Street, and has branches in Mount Union and Huntingdon where it distributes the Ford and Overland. The officers are R. B. Cassady, president and general manager, and LeRoy Closson, sales manager.

Anchor Auto Co., St. Louis, has been organized to sell the Commerce truck. J. B. Felkel is manager and salesrooms are at 4274-4276 Easton Avenue.

Gibson Electric Garage & Storage Battery Co. has taken the agency in Portland, Ore., for the Owen-Magnetic car.

Kinney Motor Car Co., Eau Claire, Wis., recently organized, with a capital stock of \$50,000, has taken quarters at South Barstow and Grey Streets, and will be northwest Wisconsin distributor of the Mitchell, Maxwell and Oakland. Thirty sub-agencies already have been established.

## When you equip with the WALTHAM—

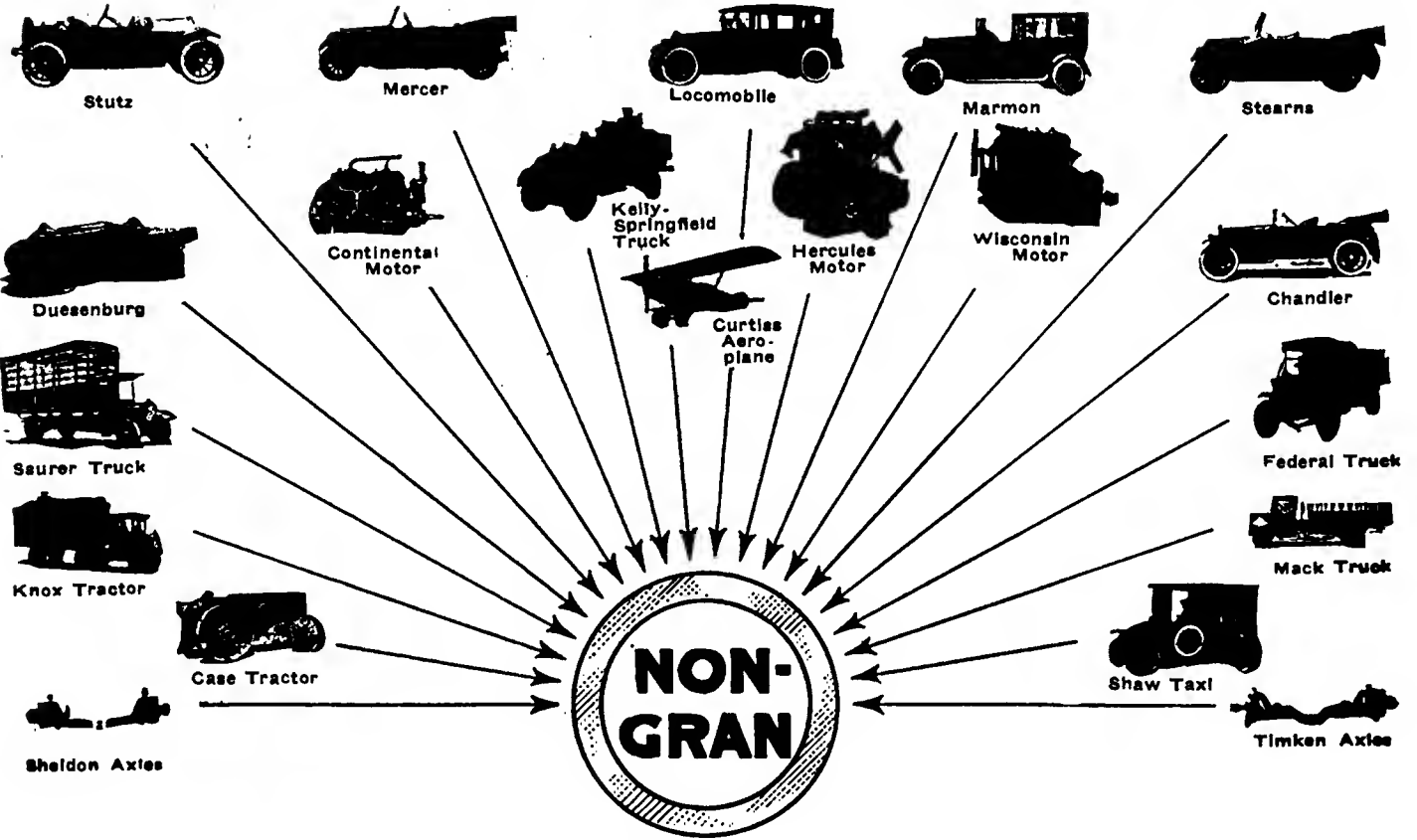


—*you equip your car* with the only clock scientifically constructed for automobile time-keeping, therefore the only accurate and reliable automobile clock made.

—*you equip the buyer of your car* with a comfort and convenience that he expects to get with a good car, and which he has reason to appreciate after he gets it.

—*you equip your dealer and salesman* with a selling argument that drives home to the prospective buyer the high quality and completeness of your car's equipment.

WALTHAM WATCH COMPANY, WALTHAM, MASS.



# One Point at Which They All Meet

YOU WILL AGREE, won't you, that—

When all these manufacturers (who differ from one another on almost every other point) unite on *one bearing bronze* as being the finest there is on the market—

There must be something Real and Tangible in the worth of that one bronze.

That one bronze is NON-GRAN.

Non-Gran Bronze possesses a degree of molecular cohesion which is not approached by any other bearing bronze made. It is, therefore, easy to understand why

Non-Gran Bushings outwear all other bushings.

Uniform physical structure is essential to uniform bearing results. This uniformity depends upon the *handling* of the alloy in its making.

Non-Gran Bronze is the only bearing bronze made that is made by men who make nothing else.

Non-Gran's strong molecular cohesion is found in *every* Non-Gran casting.

If you are not the fortunate owner of a car equipped with bushings of Non-Gran, do the next best thing—

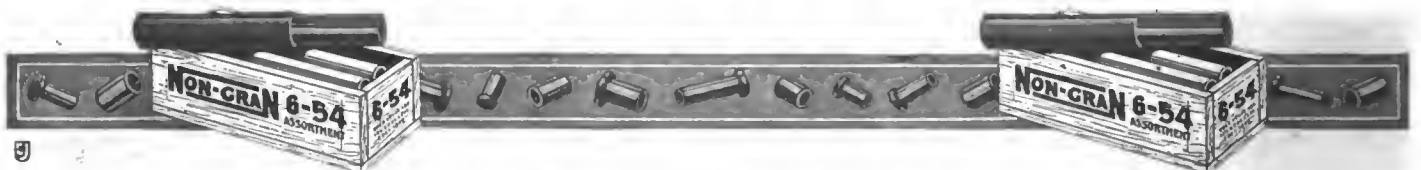
Have your repairman replace all worn bushings with bushings of Non-Gran the next time your car is "down."

By so doing you will save hundreds of dollars on future repair bills because your car will then be equipped with the same flawless, long-wearing bushings that enable quality-built cars to run so much longer than ordinary cars, without rattles and power loss.

**American Bronze Company**  
Derwyn • • • Pennsylvania

Sole makers of Non-Gran Bearing Bronze and largest exclusive manufacturers of Bearing Bronze in the world.

# HIGH SPEED NON-GRAN BEARING BRONZE



Please mention The Automobile when writing to Advertisers

**PREPARED WAX**



**Johnson's Prepared Wax**

*Now Made In Liquid Form*

so that it may be more easily applied and polished. Johnson's Prepared Wax *Liquid* is the same as our Paste Wax except that it is Liquid.

Johnson's Prepared Wax *Liquid* will prove a joy to the thousands of automobile owners who prefer a Wax Polish on their cars, but are not inclined to spend the time or effort which Paste Wax requires. — Johnson's Prepared Wax *Liquid* solves the problem.

*Apply with Cloth, Brush or Spray*

Johnson's Prepared Wax *Liquid* is very easy to apply and polish—but very little rubbing is necessary. You can go over a good sized car in half an hour. It preserves the varnish and protects it from the weather, adding years to its life and beauty. It covers up mars and scratches—prevents checking—sheds water and is absolutely dust-proof.

*Is Your Car Dirty—Grimy and Unsightly?*

You, yourself, can make it look almost like new and save the cost of revarnishing. All you need is Johnson's Cleaner and Johnson's Prepared Wax *Liquid*.

Tell your dealer that Johnson's Prepared Wax is now made in *Liquid* form and insist upon his securing it for you.

**STOP-SQUEAK OIL**



**Johnson's Stop-Squeak Oil**

*Has the remarkable property of seeping rapidly between the spring leaves*

and to the furthestmost wearing points and it there becomes a heavy-bodied lubricant.

*The irksome task* of jacking up a car, prying apart the spring leaves and lubricating them is forever done away with. You, yourself, can now keep your springs thoroughly lubricated at all times. All you need is Johnson's Stop-Squeak Oil. You won't require a tool of any kind—you don't even need to jack up the car.

*Make Your Car Ride Easily*

Johnson's Stop-Squeak Oil is a simple remedy for hard riding cars. — Instead of bumping over the road, you fairly float along if your springs are lubricated, so you have spring action. Johnson's Stop-Squeak Oil reduces the liability of spring breakage.

*For Squeaks of All Kinds*

Johnson's Stop-Squeak Oil will remove squeaks of all kinds—in springs, shackle bolts, body, fenders, top, etc. Just locate the squeak and touch it with Johnson's Stop-Squeak Oil. Insist upon your dealer supplying you with this wonderful product.

**CARBON REMOVER**



**Johnson's Carbon Remover**

*Cures 80% of Engine Trouble*

That knocking in your engine—the difficulty you have climbing hills—poor acceleration—lack of power—pre-ignition—extravagant use of gas—noisy motor—in fact, 80% of your engine trouble is caused by carbon.

*Put New Life In Your Engine*

with Johnson's Carbon Remover and it will run like it did the first 500 miles—quietly, and full of "pep". No matter how choked up your engine may be Johnson's Carbon Remover penetrates and softens the carbon. It then burns and powders and is blown out through the exhaust.

*You Can Do It Yourself*

Five minutes' time and no labor required. Simply lift the hood and pour an ounce of Johnson's Carbon Remover into each cylinder through the petcocks or spark plug openings. Go to bed—get up in the morning and drive a perfectly clean engine.

*Use It Every 1,000 Miles*

If you will use Johnson's Carbon Remover every 1000 miles you can keep your engine clean and sweet and always at its highest efficiency and you will get the maximum power and speed from the minimum amount of fuel. Insist upon your dealer supplying you with Johnson's Carbon Remover.

**JOHNSON'S AUTO PRODUCTS**

Manufactured By

**S. C. Johnson & Son, Dept. A., Racine, Wis.**

Please mention The Automobile when writing to Advertisers

# Interchangeable—

## *American Axles*

for Wire or Artillery Wheels

**W**E can furnish this "American" Axle with Driving Flanges or Inner Hubs for Artillery Wheels, Houk Wire Wheels or Hayes Wire Wheels. Such Inner Hubs must be specified.

This Axle embodies the latest "American" improvements including pressed steel brake shoes; wide service brakes and narrow emergency brakes; full floating features; Bock taper roller bearings:—

Less Weight and Greatest Possible Efficiency



*Licensed under The Kardo Company Patents*

# The American Ball-Bearing Co.

*Pioneer Axle Builders of America*

Cleveland, Ohio

Please mention The Automobile when writing to Advertisers



*What*  
**FLEXIBILITY** *really means*

EVERY car has its story of flexibility of control. Every driver tells of what he can do with his car "in high." What can be done in high gear depends a good deal upon the driver.

Flexibility really means what the car will do for any driver.



NEW SERIES

*Oldsmobile*

NINETEENTH YEAR

has the great sales feature of Flexibility to such a degree that you can leave it to the prospective customer to learn its meaning by actual driving.

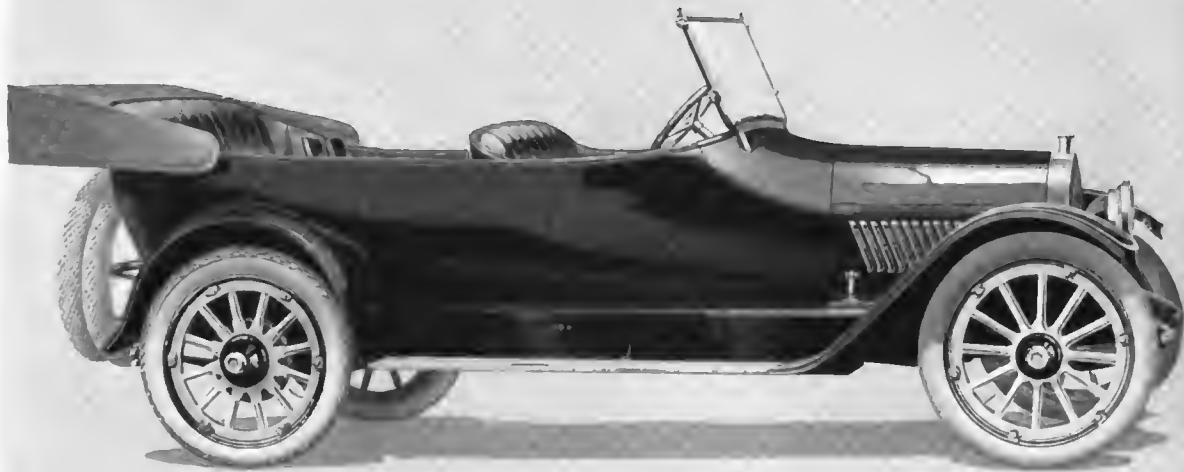
This enables him to compare it with all the cars he has ever driven. It is a "sales point" so strong that the customer actually sells himself.

The eight-cylinder, high speed motor, with light reciprocating parts and a car of light weight are the reasons for this unusual "pick-up" and acceleration.

More dealers will be needed to take care of the great demand for the New Series Oldsmobile. Advance orders indicate a record breaking year.

Responsible dealers in open territory who will feature the Oldsmobile as a leader will be considered. Many applications have already been received, so that it will be worth while to act promptly.

OLDS MOTOR WORKS  
*Lansing, Michigan*



NEW SERIES

*Oldsmobile*

NINETEENTH YEAR

*Details of the New Series*

**WHEEL BASE**—120 inches, with unusually ample body, due to short, compact motor.

**MOTOR**—Eight cylinder, V-type, high speed motor with balanced crank shaft, light weight, drop forged connecting rods, and nine-ounce aluminum alloy pistons, reducing internal resistance, vibration, and bearing pressure to a minimum. L-head with inclined valves. Cylinders cast four en-bloc with adjoining half of crank case, only two castings, bearings in left-hand block—a patented feature. Three-point suspension. Motor develops 50 horse power brake test.

**LUBRICATION**—Force feed by gear pump direct to bearings. Pressure indicated by oil gauge on dash.

**ELECTRIC SYSTEM**—Oldsmobile-Delco lighting, starting, and ignition.

**SPARK ADVANCE**—Automatic.

**CABURETOR**—Automatic compensating type, minus springs, water jacketed.

**GASOLINE SYSTEM**—Vacuum feed type, gasoline tank in rear.

**TRANSMISSION**—Unit with motor, selective type, center control. Three speeds forward and reverse. Hardened steel gears, transmission shaft mounted on ball and roller bearings.

**CLUTCH**—Leather faced, cone type.

**DRIVE**—Hotchkiss type, through rear springs. Tubular drive shaft with two large universal joints.

**REAR AXLE**—Full floating, spiral bevel type.

**BRAKES**—Service brakes, external contracting; emergency brakes, internal expanding. Brakes adjustable by thumb nut.

**SPRINGS**—Front, semi-elliptic; rear, three-quarter elliptic, underslung.

**UPHOLSTERY**—Extra quality, long grain, bright finish black leather, box pleated, with no buttons to gather dust and dirt.

**DASH**—Walnut, with nickel finished instruments, mounted flush—oil pressure gauge, speedometer, eight-day clock, ammeter, and lighting and ignition switches.

**LAMPS**—Double bulb headlights, tail light, dash light, tonneau light.

**TIRES**—33 x 4 on all but 7-passenger which carries 34 x 4. Non-skid on rear wheels throughout.

*The New Series Consists of*

Seven Passenger Touring Car	Sedan
Five Passenger Touring Car	Cabriolet
Club Roadster	Convertible Roadster

*Write for particulars of dealers' arrangement*

OLDS MOTOR WORKS  
*Lansing, Michigan*



# Back of this Crankshaft

HERE IS A CRANKSHAFT, not only forged with exact precision, but "inherently balanced," and particularly adapted to the "quick pick-up" high speed motor.

# WYMAN-GORDON

BACK OF THIS CRANKSHAFT—making its production possible—stands the fully equipped, perfectly organized plant pictured below. Contained within that plant are the men and machines that do the actual work, the forging, shaping and testing that turn billets of selected steel into crankshafts suited to the most exacting service.

BUT—OF SPECIAL SIGNIFICANCE—back of this crankshaft is the knowledge, the experience, the skill to apply proven principles to the problem at hand. Our engineers have bent their energies for years to the proper solution of crankshaft problems, in co-operation with manufacturers of the highest type.

THIS CO-OPERATION is the real key to Wyman-Gordon success—it represents more dollar for dollar value to the motor car manufacturer, and more real solid progress toward perfection of forging practice, than any other one thing.

*We should be glad to co-operate with you in solving your forging problems.*

WYMAN - GORDON COMPANY  
 Worcester, Mass. Cleveland, Ohio

## GUARANTEED FORGINGS~



Please mention The Automobile when writing to Advertisers



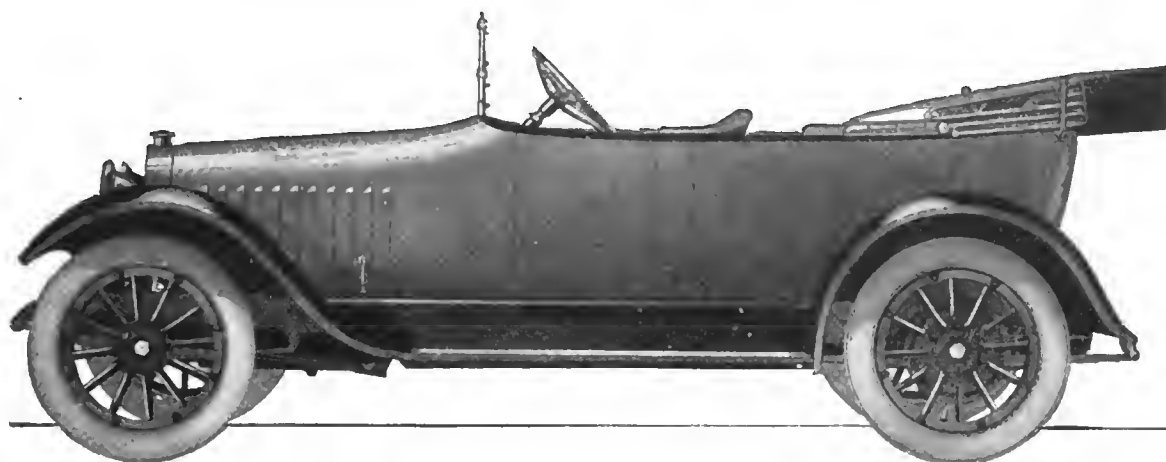
# A Big Chalmers Year

**Big in number of cars built. Big in volume of sales. Big in profits for dealers.**

**Chalmers starts the year right. With a strong organization, planning great things. With a sound and sensible car; popular in the cities; popular in the suburbs; popular on the farms. With an exceptional line of closed cars including all the well known types of bodies.**

**The Chalmers cars today combine the sturdiness required on the farm with the style**





required on Michigan Boulevard in Chicago and Fifth Avenue in New York. And the prices were never before so inviting.

Ambitious dealers in rural districts will find a Chalmers connection very attractive just now and extremely profitable in years to come.

**It is a big Chalmers year.**

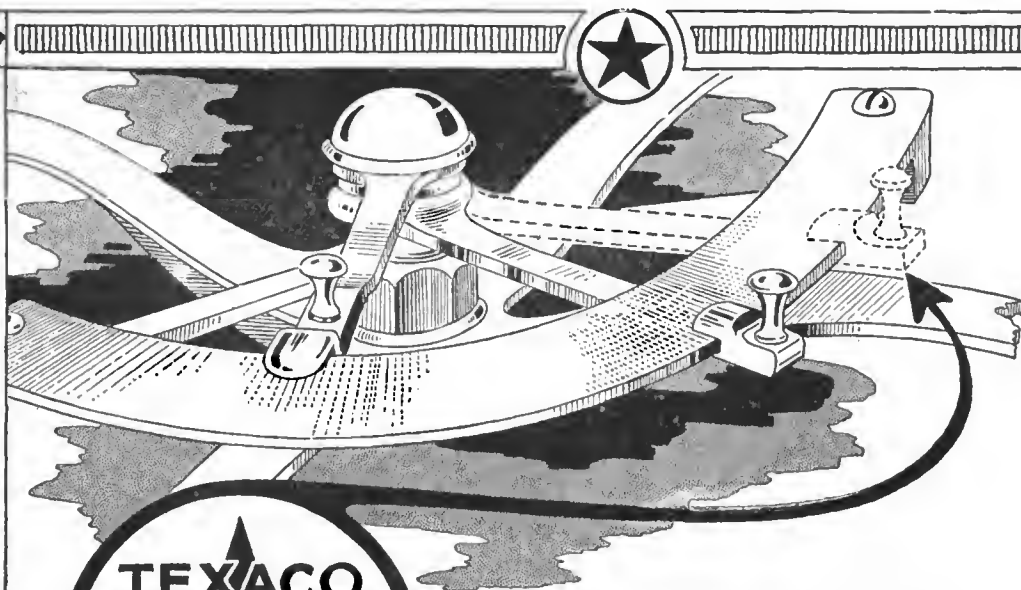
Present Prices

Five-passenger Touring	- - -	\$1090	Seven-passenger Touring	- - -	\$1350
Two " Roadster	- - -	1070	Seven " Limousine	- - -	2550
Seven " Touring Sedan	- - -	1850	Seven " Town-car	- - -	2550

(All f.o.b. Detroit)



Please mention The Automobile when writing to Advertisers



## The Tale The Throttle Tells

**T**HE throttle of your car tells an interesting tale to those who will listen—a tale of power developed, of gasoline and oil consumed.

You know that when a motor is running at its best the throttle need not be advanced so far to obtain a given speed as when the motor is not quite up to par. This means that it takes less gasoline in one case than in the other to go a given distance.

Try this simple test—mark lightly on the sector the point to which the “gas lever” must be advanced to obtain a speed of twenty miles an hour on a level road with the motor oil you are now using. Then drive over the same road at the same speed after having substituted for the old oil

## TEXACO MOTOR OIL

Unless your car is one of the exceptions which help to prove all rules you will find that the lever does not reach the mark previously made. What does this show? Simply, that with Texaco Motor Oil, you are getting more power and using less gasoline.

Why does Texaco Motor Oil produce this result? For several reasons.

Texaco Motor Oil is a southern oil with an asphaltic base. It is admitted by the most eminent authorities that the hydrocarbons composing the asphaltic base oils *cannot* form hard carbon.

Texaco Motor Oil stands up well, maintains

its body and lubricating qualities in use because it gives a good seal to the piston and rings and prevents leakage of gasoline into the crank case.

Because of these facts Texaco Motor Oil enables a motor to run at its highest point of efficiency, enables the gasoline to deliver its maximum power, and as a result gives high mileage.

You can judge a motor oil very fairly by its color. Compare Texaco with others. Note its clear, clean color.

When you buy motor oil buy Texaco. The best way, the safest way, is in 1 or 5 gallon cans.



**THE TEXAS COMPANY**  
17 Battery Place New York



## A Car of the New Construction

For a car of its capacity the Monroe is extremely light. This advantage has been achieved by following the modern method of substituting for mere bulk and weight, more careful design and better materials. The object of this scientific attention to light rigid structure is, of course, to secure maximum power with a minimum gasoline consumption, and to permit of large savings in tires and oil.

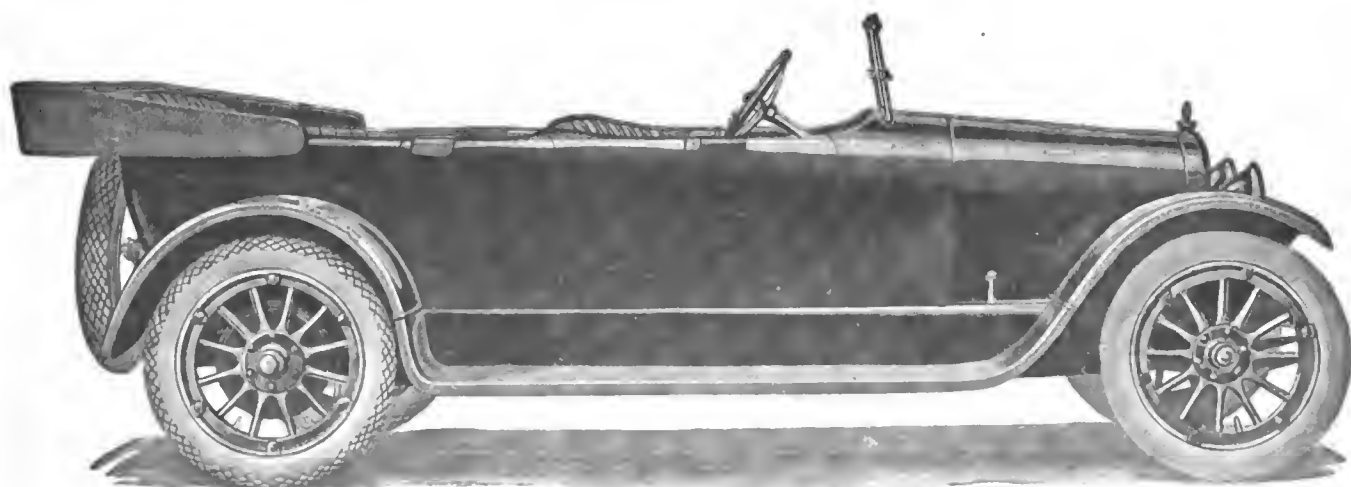
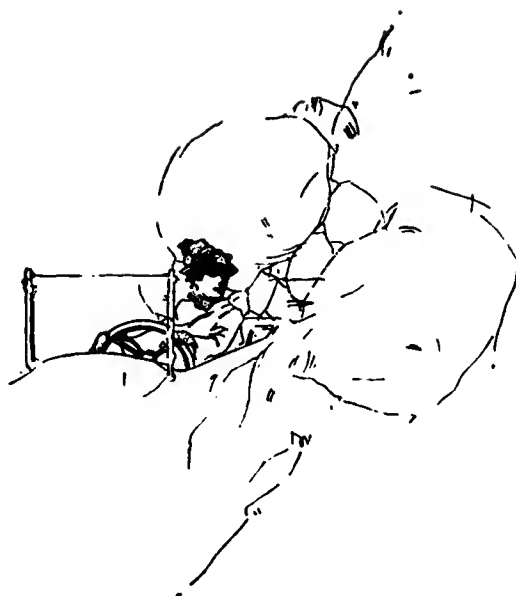
The basis of this new trend in construction is the Brush patented chassis structure by which the frame is designed to follow closely the body contour. The frame is made deeper than the ordinary frame, and the running boards made part of it. With this structure bodies may be made absolutely as light as will permit carrying the weight of the passengers. The frame, though of lighter stock than usual, supports the structure more effectively and is so rigid and stable that the doors keep their alignment indefinitely and squeaking and rattling of the superstructure after the car has been driven a while is entirely obviated.

The Monroe motor is built on the same principles of light, stable construction and maximum efficiency as the body and chassis. Heavy metal does not necessarily mean power. Quite the reverse is the case with the Monroe; for we have built a light, high speed engine that is as powerful and economical as any on the market. We have done this by taking the utmost care with the design and the selection of materials. The highest grade of workmanship and extreme accuracy is found throughout.

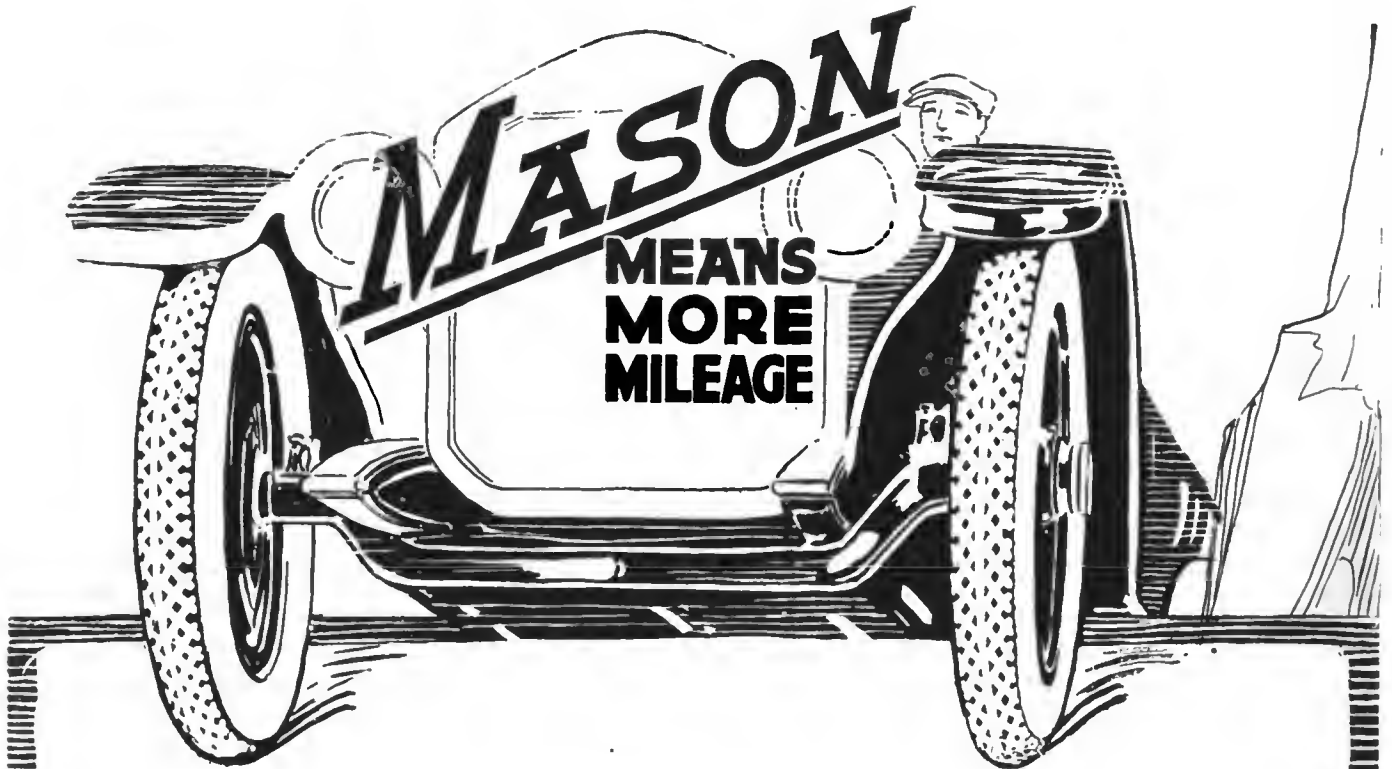
Combined with this scientific refinement of construction you will find in the Monroe Car every standard unit that makes for efficiency and every significant engineering feature which will add to the service qualities of the Monroe Car. It is a car for the most discriminating people. It is a car that will interest dealers who like straight, staple business.

Price, \$985 f.o.b. Pontiac.

**THE MONROE MOTOR COMPANY**  
PONTIAC MICHIGAN



U



## Sturdy Quality at a Popular Price

This is the MASON story in a nutshell. MASON Tires have all the sturdiness that fine materials and skilled craftsmen can weld into the serviceable qualities that the year-in-and-year-out motorist demands.

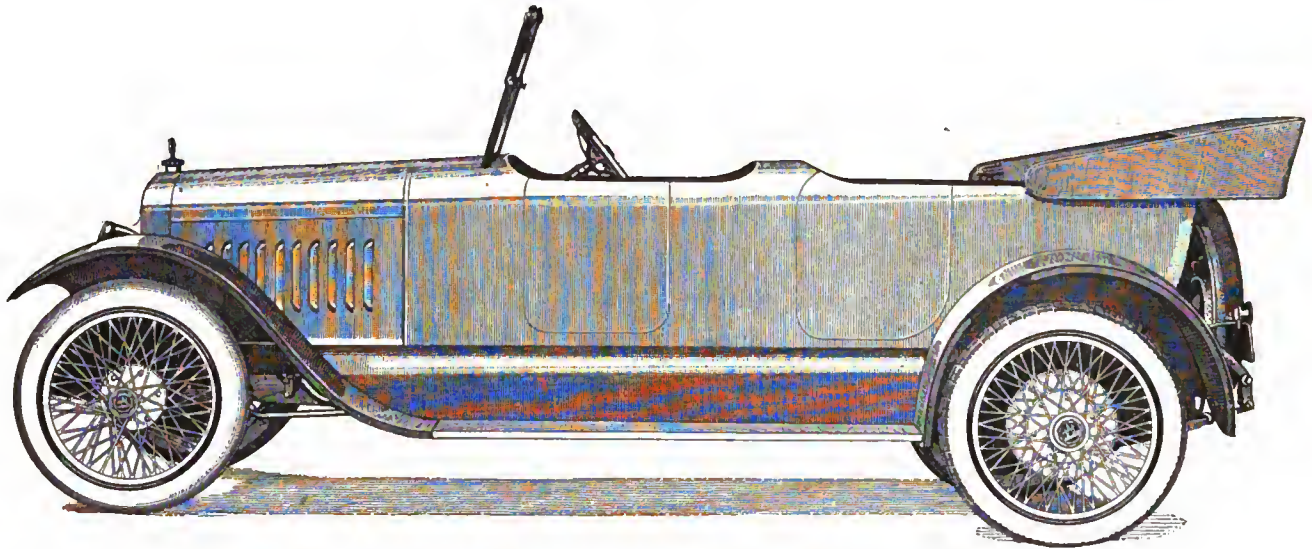
Wherever you find MASON Tires, you find car owners thoroughly satisfied with their tire values. More—you find dealers so enthusiastic over MASON merits that they're conscientiously recommending MASON as the tire that lives up to its slogan.

You should be well acquainted with the MASON plan—you'll find it well worth while to learn something of it.


*MASON is establishing its distribution firmly—a few territories that are still open offer broad opportunities.*

**MASON** Tire and Rubber Company  
Factory, Kent, Ohio

Akron suburb



# The Hal Twelve

 Gasoline consumption is low for a car of such power, averaging 10 to 13 miles to a gallon. The consumption of oil, too, is low. Multiplication of cylinders, with valve-in-head type construction, means something more than great smoothness, great power and wonderful activity. It means unexpected economy.  
Hal Motor Car Company, Cleveland, Ohio

Please mention The Automobile when writing to Advertisers



12 Acres of  
Floor Space

Unequaled Supply  
of Raw Materials

## BIRTHPLACE OF BABCOCK QUALITY

Tremendous Capacity—Unit System of Production  
in 1000 Lots—Low Operating Costs.

Born at this site in 1845, "Babcock Quality" is today the foundation and corner-stone upon which a great industrial plant has grown. "Babcock" has meant "Quality" to generations of carriage owners. The same sterling quality distinguishes

# BABCOCK

## COMMERCIAL BODIES

Available water power of over 1000 H.P. makes us independent of the mounting cost of coal.

Sheds which house over 2,000,000 feet of seasoning lumber insure a constant supply of the choicest native hardwoods—the best obtainable anywhere.

From our own dry-kiln the wood comes in prime condition to the saws and benches of our wood-shop.

Our own smith-shop produces the patented steel skeleton which makes every Babcock Body lighter and stronger than those of other makes.

Over 12 acres of factory floorspace afford the room required for tremendous volume production.

Paint-shops, themselves as large as the ordinary factory, accommodate the entering stream of bodies, which emerge with the smooth, enduring evenness of finish which reflects our long supremacy in this, the coach-builder's unrivaled art.

Our huge shipping warehouses and railroad sidings permit the prompt shipments of which we justly boast.

An organization trained for 50 years in the finest quality of body-building makes for efficiency in all departments.

These unparalleled advantages, which make our factory overhead unusually low, unite with our quality production to permit you to buy "Babcock Quality" Bodies at Remarkably Reasonable Prices.

### TO BUYERS

There is more dollar-for-dollar value in a Babcock Body from your own standpoint than in any other commercial body you could possibly obtain. They are lightest, strongest and cheapest in final cost.

We make a Body for Every Need.

### TO DEALERS

Babcock Bodies carry their own story. They are the quality bodies for commercial cars. They sell themselves and stay sold. The Babcock name and reputation is convincing, and our advertising adds the last link to the chain of selling evidence.

We want dependable dealers. If you are in the game to stay, get our catalogs and dealers' proposition. Both are handsome.

**H.H. BABCOCK COMPANY**  
**WATERTOWN, FOUNDED 1845 NEW YORK.**

Please mention The Automobile when writing to Advertisers

# You Lose Unless You Use



## VANADIUM SPRINGS

Because vanadium endows steel with unequaled strength, toughness and resistance to fatigue, vanadium steel is universally acknowledged as the steel of

### Maximum Spring Quality

Here is proof: The Penn Spring Works, Baldwinsville, N. Y., recently put carbon and vanadium steel springs of identical design through vibratory tests to determine their relative durability.

#### RESULTS

Average of 3 Tests	Vibrations
Carbon Springs	- 153,000
Vanadium Springs	- 452,000

# TRIPLE THE LIFE OF CARBON SPRINGS

**AMERICAN VANADIUM COMPANY**  
 NEW YORK                      PITTSBURGH                      LONDON





# SKF

Copyrighted by  
Underwood & Underwood

## *Used the World Over*

In the most remote corners of the world—whether on the perfect boulevards of Europe or the rugged roads, hills and vales of America, Canada, Australia, Asia or Africa—S K F Ball Bearings have established a reputation for “Quality and Service.”

Made of Swedish Crucible Steel of the highest analysis—of efficient design and manufactured under the scrutiny of our skilled and thoroughly equipped organization, S K F Ball Bearings are giving long, hard dependable service—because of the rigid control and uniformity of materials used in their manufacture.

HARTFORD

**SKF BALL BEARING CO.**

CONN.



Please mention The Automobile when writing to Advertisers

**\$1150** F. o. b.  
Racine

Mitchell Junior—a 40-h. p. Six  
120-inch Wheelbase

*Mitchell*  
SIXES

**\$1460** F. o. b.  
Racine

7-Passenger—48 Horsepower  
127-inch Wheelbase

# This Year—25,000 Cars

## A New Size—Mitchell Junior

The Mitchell factory this year will build 25,000 cars. It never falls down on its schedules.

The smaller Mitchell—called Mitchell Junior—opens up an enormous new field.

We shall spend in advertising \$1,000,000 to make Mitchell attractions known.

We are adding 24 per cent to luxury and beauty. In every part we attain 100 per cent over-strength. The car includes 31 extra features. And there are eight styles of Mitchell bodies.

So the Mitchell today is the most attractive line in the field of high-grade cars.

### Solid Features

The Mitchell advantages are all due to efficiency, as developed by John W. Bate.

In no other factory in the world could a car of Mitchell quality be built at anywhere near our cost. And all that saving goes to pay for perfections which others can't afford. In a hundred ways it shows in strength, beauty, comfort and convenience.

These are enduring advantages. It has taken Mr. Bate 14 years to secure them. And we do not believe that any rival car will ever match Mitchell efficiency.

### Our New Body Plant

From now on we make all our own bodies, open and enclosed. So more of the Mitchell is built by the maker than of any other quality car. It is built in a factory which John W. Bate designed. It is built by machines of his selection, which mark the last word in efficiency.

It is built by men who live here. Many are men whose fathers spent their lives with this concern. The building of the Mitchell car is their lifetime occupation.

No other motor car in the world is built under such ideal conditions.

### Mark the Results

You will see the result in our engineering standards. There are over 440 parts built of toughened steel. There is a wealth of Chrome-Vanadium. There is oversize in every vital part.

Three years ago Mr. Bate started out to double our margins of safety. Today every part in the Mitchell shows 100 per cent over-strength.

Two years ago this standard was adopted in the Bate cantilever springs. Since then, not one has broken. That is simply one example of the Mitchell over-strength.

This year we are adding 24 per cent to the cost of our finish, upholstery and trimming. This is paid for by savings which our new body plant has accomplished.

And this year our extra features are increased to 31. That is, features—like a power tire pump—which very few cars include. No rival car has more than four of these extras.

If you are interested in motor cars—as a buyer or seller—these results of Bate methods are bound to appeal to you. They give to the Mitchell a hundred distinctions.

We are telling this story to millions now—in newspapers, magazines, weeklies and farm papers. No other quality car is advertised to a like extent. And no other car in this class offers dealers an equal opportunity.

MITCHELL MOTORS COMPANY, Inc.  
Racine, Wis., U. S. A.

### TWO SIZES

**Mitchell**—a roomy, 7-passenger Six, with 127-inch wheelbase. A high-speed, economical, 48-horsepower motor. Disappearing extra seats and 31 extra features included.

Price \$1460, f. o. b. Racine

**Mitchell Junior**—a 5-passenger Six on similar lines with 120-inch wheelbase. A 40-horsepower motor— $\frac{1}{2}$ -inch smaller bore than larger Mitchell.

Price \$1150, f. o. b. Racine

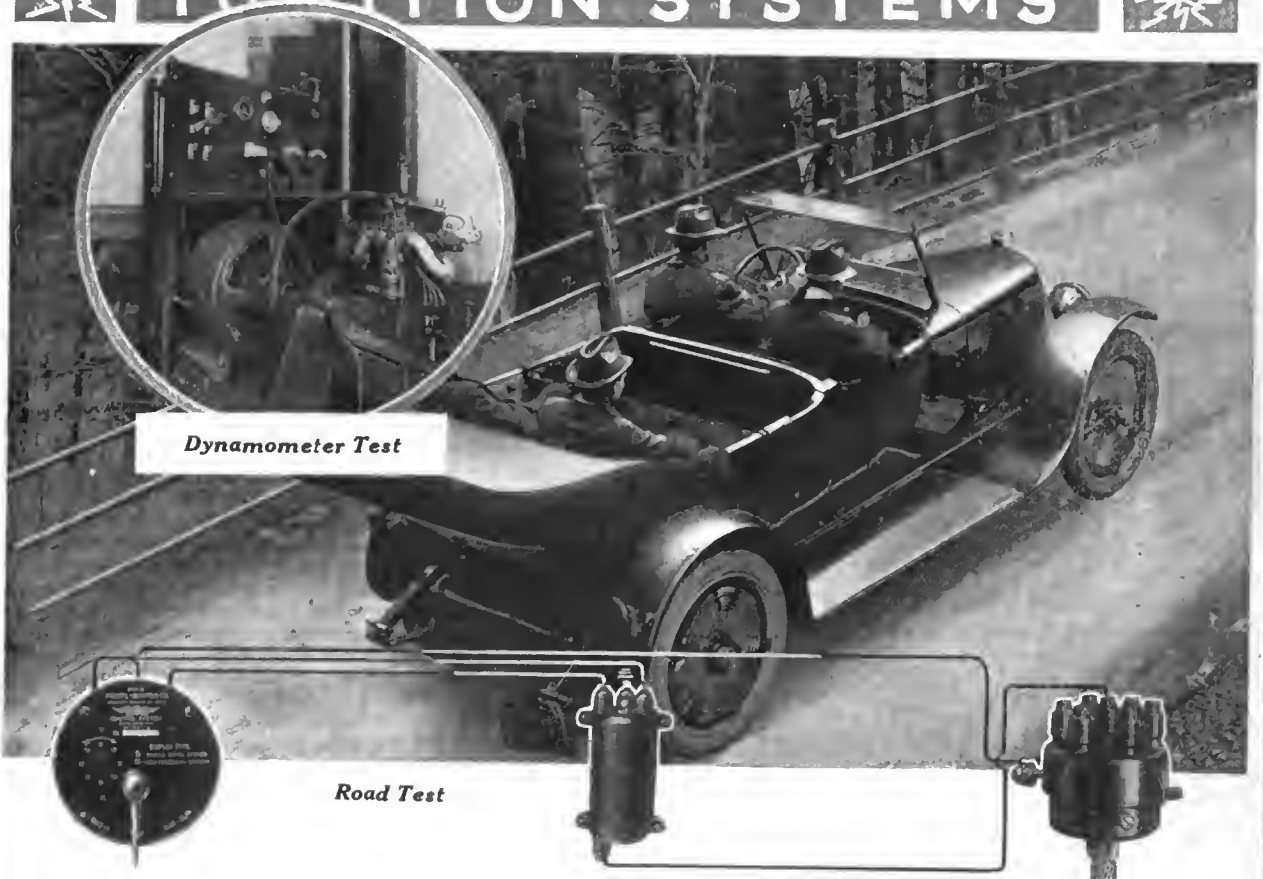
Also all styles of enclosed and convertible bodies. Also demountable tops.



Please mention The Automobile when writing to Advertisers

# D U P L E X P H I L B R I N

## IGNITION SYSTEMS



Dynamometer Test

Road Test

**I**N performance, we believe this new system of "Duplex" ignition possesses more distinct advantages and will deliver more uninterrupted satisfaction than any other ignition system on the market.

To appreciate its greater efficiency you should see it in action.

It transforms an old motor completely.

It enables it to take grades heretofore impossible on high, swiftly and easily, without the slightest suggestion of laboring.

Abuse it—step on the throttle, throw it clear down as you have never dared before. The response is instantaneous, not the slightest sign of choking, not even a falter.

In every day running you will be continually finding new things in its favor.

Its ability to render the motor more responsive, more flexible, more powerful and *far more economical of fuel* is truly wonderful.

On difficult grades it fairly lifts the motor along and on the clear stretches there seems no limit to her new-found power.

For cold weather driving **PHILBRIN Duplex Ignition** has many distinct advantages.

By a turn of a switch a *high-frequency* system of ignition is brought into use—a system that distributes a "shower of sparks" of remarkable intensity to each cylinder in its firing order, at the rate of a *thousand sparks a second*.

No matter how cold the motor it invariably capitulates before this

system. For a lean mixture, a low grade fuel, fouled spark plugs or faulty carburetor adjustment this system is invaluable.

By a turn of the switch you can run on either system. Each has its own individual advantages. Either system can be used continuously. Neither system will wear out before your car.

The current consumption is negligible—a set of dry cells will operate a 4-cylinder system for months.

Easily attached to any motor, without changing the motor. Moderate in price.

Write for descriptive catalogue.

**Dealers—Jobbers:** Our distributing arrangements are being completed NOW. Write for details.

## PHILIPS-BRINTON COMPANY

Sales offices

Weidener Bldg.

Philadelphia, Pa.

501 South Broad St.

Kennett Square

Pennsylvania



Please mention The Automobile when writing to Advertisers

# Fyr-Fyter Saves 15% on Auto Fire Insurance

Approved by Underwriters'  
Laboratories



## It Stands Between You and Danger!

The motorist of today demands more than just a fire extinguisher. He wants the extinguisher that affords the best and most dependable protection. That is the reason Fyr-Fyter is the choice of careful motorists everywhere.

### FYR-FYTER GIVES INSTANT ACTION

The scientific, durable construction of Fyr-Fyter, with its exclusive Fyr-Fyter features, mean the best fire protection possible to be had. Its swift continuous stream free from entrained air carries effectively 25 to 30 feet. Compounding action of pump brings an even, powerful pressure which it continues to furnish, even after the pumping has stopped. Stream may be shut off at will—"panic proof" shut-off valve is operated by the handle.

### HIT THE HEART OF THE BLAZE QUICK AND SURE

The lubricated piston of Fyr-Fyter not only makes pumping easier, but helps you in directing the stream. Continuous pumping is not necessary. Attractive soft gun-metal finish matches the upholstery of your car and adds attractiveness that is not conspicuous. Ask your motor accessory dealer to demonstrate Fyr-Fyter because Fyr-Fyter offers you the safest and best protection. See him today! Dealers: Write us now for complete facts and 1917 sales policy. Fyr-Fyter advertising is covering your territory now. Write us today.



**THE FYR-FYTER CO.**  
100 Patterson Building, Dayton, Ohio



Please mention The Automobile when writing to Advertisers

# The Survival of the Fittest

# A Spark



# C Plugs

Unanimous Choice of 68  
Leading Makers of Cars

All Plugs Were Tried Out—  
The Tests Were Exhaustive

# A·C· W O N

At the Shows and Always, These Cars Are AC Equipped

Cadillac  
Pierce-Arrow  
Packard  
Marmon  
Hudson  
Chalmers  
Hupmobile  
Haynes  
Dort  
Cole  
Reo  
Paige  
Peerless  
Saxon  
Stutz  
Pilot

Buick  
Oakland  
Oldsmobile  
Jeffery  
KisselKar  
Premier  
Knox  
Jordan  
Liberty  
Crane-Simplex  
Dodge Brothers  
Stearns-Knight  
McLaughlin  
(Canada)  
Singer  
Stephens

United Truck  
Wilcox Trux  
National  
Velie  
Jackson  
Westcott  
Pathfinder  
Chandler  
Chevrolet  
Apperson  
Davis  
Daniels  
Detroit  
Paterson  
McFarlan  
Scripps-Booth

Bour-Davis  
Lexington-Howard  
Murray  
Monroe  
Signal Truck  
Sandow Truck  
Sterling Truck  
Chase Truck  
Moreland Truck  
Republic Truck  
Four Wheel Drive  
American-La France

G. M. C.  
Diamond T  
Truck  
Netco Truck  
Gramm-Bernstein Truck  
Brockway Truck  
Federal  
Abbott  
Gabriel Truck  
Anderson

MR. DEALER;  
Your customers is glad to  
take your advice; he  
knows YOU KNOW.

Look for the "A C" Burnt Into the Porcelain

## Champion Ignition Company

Flint, Michigan

*The Standard Spark Plug of America*



# In the Steering Column

The illustration shows the application of Bound Brook Oil-less Bushings as used in all Jacox Steering Columns, manufactured by the Jackson - Church - Wilcox.



## BOUND BROOK

TRADE MARK REG. U. S. PAT. OFF.

THE use of plain ordinary bronze bushings in the steering column simply means that the owner must never forget to keep the bushings well lubricated.

For neglect here would mean quick bushing wear, a stubborn wheel to turn and the ever present possibility of the bushings gripping or sticking with disastrous results to the driver.

But with BOUND BROOK (*Graphite and Bronze*) Oil-less Bushings in the steering column there is positive and lasting assurance of a smoothly efficient, quick, easy turning column, *even though you neglect the bushings.*

BOUND BROOK (*Oil-less*) Bushings are self-lubricating. They contain within themselves sufficient lubrication to last their life-time. You need never worry about them. They need no attention to give efficient service.

BOUND BROOK (*Oil-less*) Bushings are used instead of ordinary bushings in bearings places about automobiles and trucks that are difficult or impossible to keep properly lubricated.

### BOUND BROOK OIL-LESS BEARING COMPANY

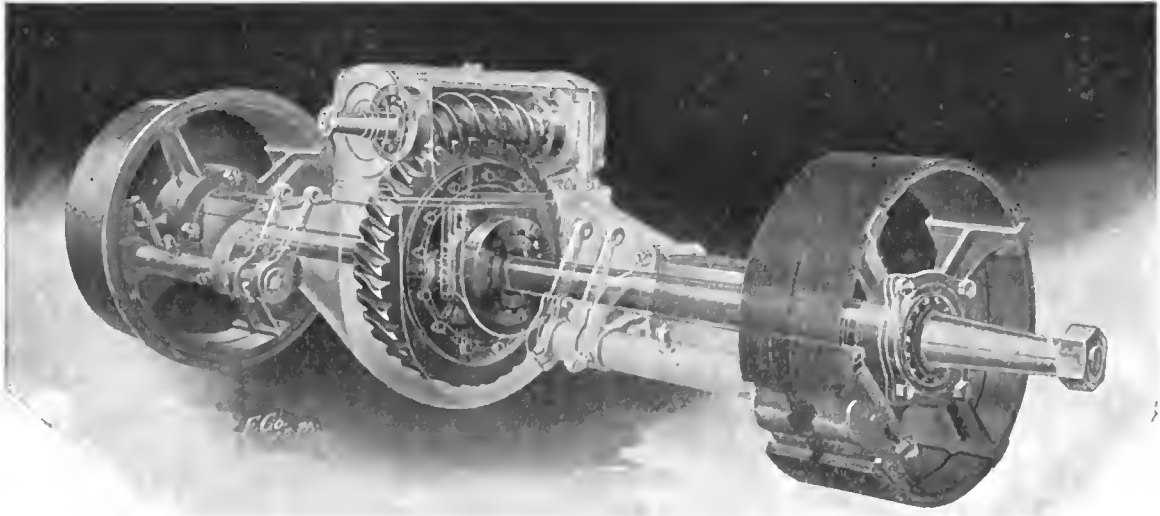
Specialists in the manufacture of Oil-less Bushings for more than a third of a century

BOUND BROOK, NEW JERSEY

Manufacturers of Nigrum (Impregnated Wood) Oil-less Bushings.

All Genuine Graphited Oil-less Bushings have always been made at Bound Brook, U. S. A.

Please mention The Automobile when writing to Advertisers



# SHELDON

## Semi-Floating Worm Gear Axles Are SOUND Axles

SOUND in design because they are simple.

SOUND in construction because of the high quality of their materials.

SOUND in performance because they are built to stand up under the rack and grind of heavy duty truck service.

“The highest priced axles in the world, and worth all they cost.”

### Sheldon Axle and Spring Company

Wilkes-Barre, Pa.

WINNER OF GOLD MEDAL AT PANAMA-PACIFIC INTERNATIONAL EXPOSITION

# POVASCO

## RADIATOR FILLER CAPS



### A Complete Service

**P**LACING POVASCO composition at the disposal of the industry in the form of high quality Radiator Filler Caps is a service that surely will be appreciated by a car owner, and taken advantage of by every jobber and dealer in the United States. Because with 20 separate models of Radiator Caps we take care of practically all of the popular cars that are now being made.

These Caps are moulded from a special composition which, when burnished, takes a high, attractive polish, and at the same time withstands heat, cold, rain and sunshine without any deterioration of either efficiency or finish.

When one considers the make-up of the ordinary radiator filler cap and contrasts it with the indestructible and beautiful POVASCO construction, it is obvious that our statement made in the caption is true. With this line we render the trade **A COMPLETE SERVICE.**

How complete that service is, is shown from another angle by the list of cars printed at the right, in which the various makes are listed with the number of POVASCO Cap which is designed to fit the radiator.

Jobbers and dealers should get in touch with us immediately to find out how attractive a proposition we can make on these caps. We do not wish to hurry you unduly, but we do urge that you get in your request soon so that we can provide for you in this year's production.

*Write for beautiful booklet describing these and the POVASCO Steering Wheel.*

**Pouvailsmith Corporation**  
 Poughkeepsie New York

### Makes of Cars and Their Cap Numbers

Abbott-Detroit	6	Kissel Kar	5
Allen	3, 8	Krit	6
American Motors	12	Locomobile	5
Auburn	8	Lozier	18
Barley	1	McFarlan	5
Bartholomew	8	Madison	12
Bell Motor	12	Malcolm	6
Bour-Davis	12	Martin Carriage	12
Buick	9	Maxwell	16
Cadillac	4	Merced	18
Carter Car	8	Meteor	17
Case	2	Michigan	8
Chalmers (Model 17)	14	Mitchell	8
Chalmers 1912 or earlier	2	Moline	8
Chalmers 1915-16-17	20	Moline Plow Tractor	1
Chandler	5	Moon	4, 6
Chevrolet Baby Grand	8, 12	Oakland	5
Chevrolet Little Six	1	Oakland, 1916-Little Six	1
Chevrolet Royal Mail	8, 12	Oldsmobile	5
Chevrolet (490)	13, 16	Oldsmobile 1918	14
Cole	5	Paige 1914 or earlier	1
Crawford	8	Paige 1915	5
Cunningham	3	Paige 1915 and 1918	17
Dauch Tractor	1	Patterson	8
Denby	1	Pierce-Arrow	3, 5
Detroit	17	Pilot	6
Diamond T Truck	6	Reo	19
Dodge	2	Republic Truck	8
Dort	8	Rock Hill Motor Buggy	12
Empire	1	Ross Eight (All Models)	17
Flaher-Magic	3	Saxon	8
Ford	11	Scripps	1
Glide	7	Service Truck	6
Grant	8	Shaw Taxicab	8
Haynes	3	Speedwell	2
Henderson	5	Standard Truck	8
Hereschhoff	8	States Motor	16
Hudson 8-40	4, 6	Stearns-Knight 4 cylinder	5
Hupp 1915 and after	7	Stearns-Knight 8 cylinder	8
Imperial	3	Stevens-Duryea	5
Indiana Truck	8	Studebaker	2
Interstate	6	Stutz	3
Jackson	6, 8	Sun	12
Jeffery 4 cylinder	17	Velle 1916	8
Jeffery Truck	17	Velle 1914 and 1915	2
Jeffery 1918 and 1917	15	Westcott	3
Kentucky Wagon	13	White	3
King	1, 12	Winton	3





Die Erinnerungen eines alten Musikers

## COLUMBIA RECORDS

© Columbia Graphophone Co.

**T**HE memories that music brings—all the poignant beauty, majestic grandeur and soul-thrilling splendor of the immortal music that, once heard, haunts memory's chambers forever, is echoed in the *tone* of Columbia Records.

**T**HE voices of Barrientos, Lazaro, Sembach, Nielsen or other world-famed artists; the playing of Ysaye, Casals, Hofmann, Parlow; the triumphs of the Chicago Symphony Orchestra—all glow with life on Columbia Records.

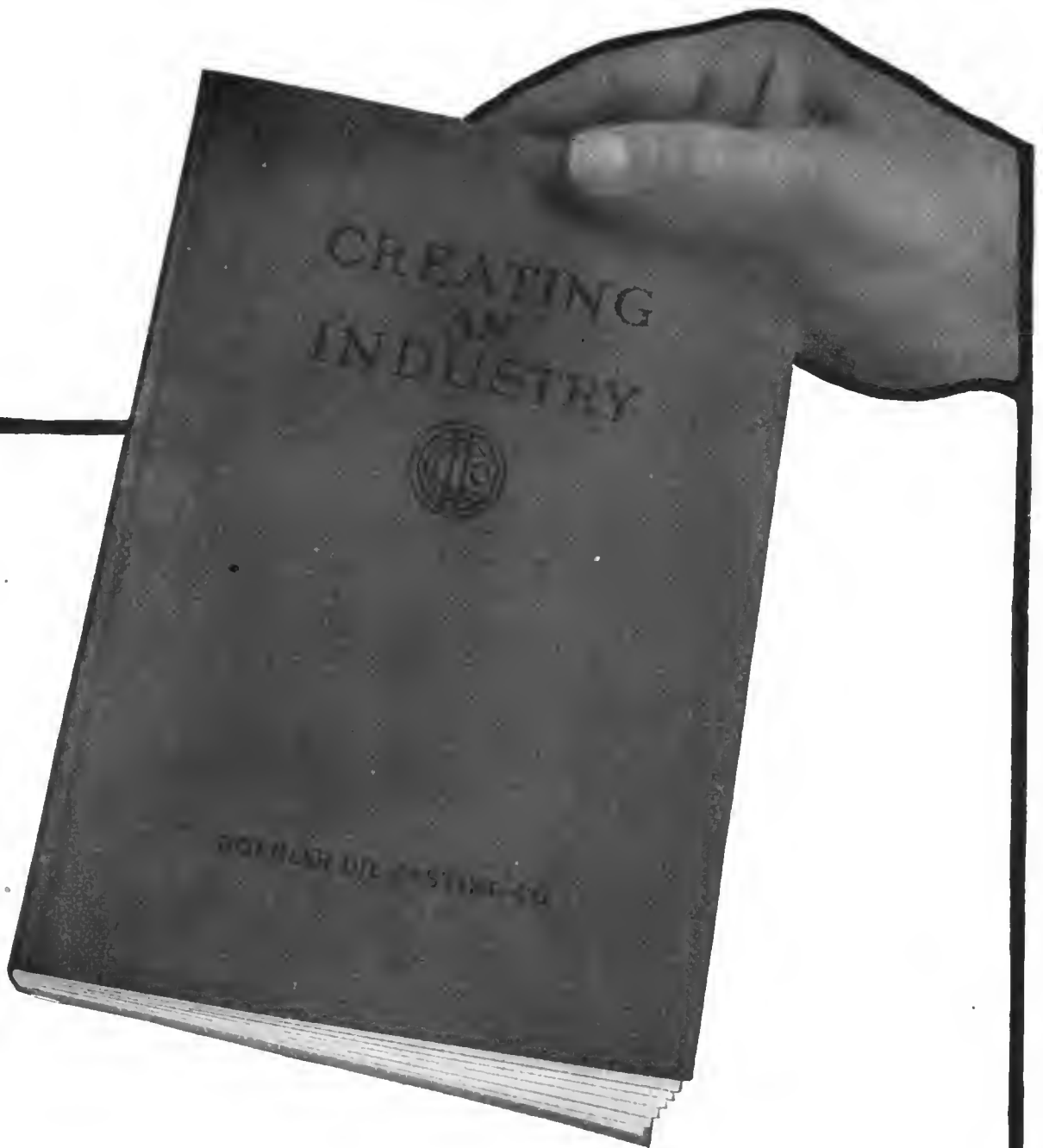
**Y**OU will be thrilled again by the glorious symphonies, immortal arias and supreme conceptions of the world's eternal Masters of Music if your home is enriched by the precious possession of the records that wake memories to *life*. "Hearing is *believing*."

New Columbia Records  
on sale the 20th of every month



Columbia Grafonolas \$15 to \$350  
Prices in Canada plus duty

Please mention The Automobile when writing to Advertisers



## Your Catalog Library

is not complete if it does not contain a copy of this *valuable reference book on die-castings*. A copy awaits your request.

**DOEHLER DIE-CASTING CO.**  
**BROOKLYN. N.Y.**  
**NEWARK. N.J.      TOLEDO. OHIO.**

Please mention *The Automobile* when writing to Advertisers

# Firestone



## *Motor Car Snow Shoes*

OVER deep snow and slushy roads Firestone Tires carry your car with maximum ease of going. They are steady, safe and sure.

The quality of rubber in the Firestone Non-Skid tread insures a firm grip, good traction and long added wear.

And this matchless Firestone quality is yours at prices charged for ordinary tires. This saving is possible only because of methods and machinery highly efficient and modernized up to the minute. Also because of enormous output, and wide distribution expertly and economically handled. For safety and saving in the highest degree, ask your dealer for Firestone equipment.

**FIRESTONE TIRE & RUBBER CO.**  
Akron, O. Branches and Dealers Everywhere



# WOODWORTH

## Spring Cover and Lubricator

SAVE YOUR SPRINGS AT LITTLE COST by using a Woodworth Spring Cover.

IN A FEW MINUTES, WITH LITTLE TROUBLE, you can lace it over your springs and save them from rust, dust, and breakage. The result is an easy-riding, constantly lubricated spring. The improvement in the riding of your car is remarkable. All squeaks are eliminated and the car rides as though equipped with a set of shock absorbers.

RUSTY, NEGLECTED SPRINGS ARE LIABLE TO BREAK, but even before then they are of little service as vibration-preventers.

A WOODWORTH SPRING COVER protects the spring, cuts rust already accumulated, and prevents the accumulation of more. It keeps the spring free from dust and mud, well oiled, and noiseless.

LOW IN PRICE, SIMPLY MADE OF STRONG LEATHER lined with felt wicking, it is a spring-saver and a trouble-saver, preserving the comfortable riding qualities of your car and saving you the expense of spring renewals.

Once saturated with oil, it will not require renewing for an entire year.

Made to fit all makes of cars. Dealers are handling these spring covers with profit and satisfaction. Customers appreciate being advised of this easy method of spring protection. Write for generous terms.

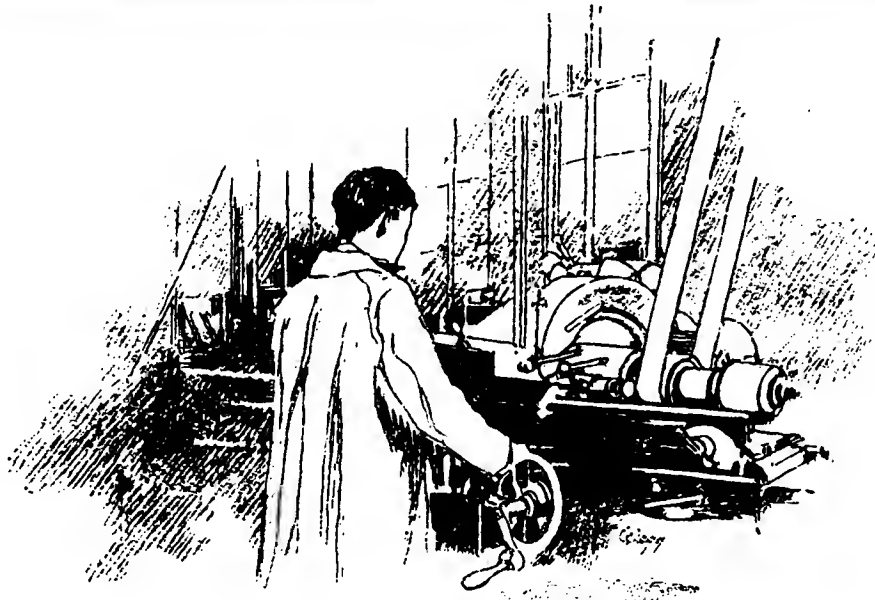
**PRICES**

Size	Genuine Leather	Imitation Leather
12 in. or less.....	\$0.65	\$0.20
12-14 in.....	.90	.40
14-16 in.....	1.10	.50
16-18 in.....	1.30	.60
18-20 in.....	1.50	.70
20-22 in.....	1.70	.80
22-24 in.....	1.90	.90
Over 24 in.....	2.00	1.00

## WOODWORTH MANUFACTURING CORPORATION

NIAGARA FALLS, NEW YORK

CANADIAN FACTORY, NIAGARA FALLS, ONTARIO



## GRINDING TRANSMISSION GEARS AND SHAFTS

# BROWN-LIPE

INSTEAD OF MERELY ASSEMBLING the gear blanks just as they come from the forge, all gear faces are first ground absolutely parallel before shaping, so that the gear teeth cannot fail to be cut exactly at right angles to the face of the gear.

THIS PRELIMINARY MACHINE WORK offers only one illustration of the many little refinements of manufacturing that help to make the Brown-Lipe products so markedly superior.

IT IS AN INDICATION of that "infinite capacity for taking pains" which is said to make possible the masterpieces of Genius.

### BROWN-LIPE GEAR CO.

SYRACUSE

Transmissions

NEW YORK

### BROWN-LIPE CHAPIN CO.

Differentials

New York: Thos. J. Wetzel, 29 W. 42d Street.  
San Francisco: A. H. Coates, 444 Market Street.  
Foreign Agent: Benjamin Whittaker, 2 Norfolk Street, Strand, London, W. C.

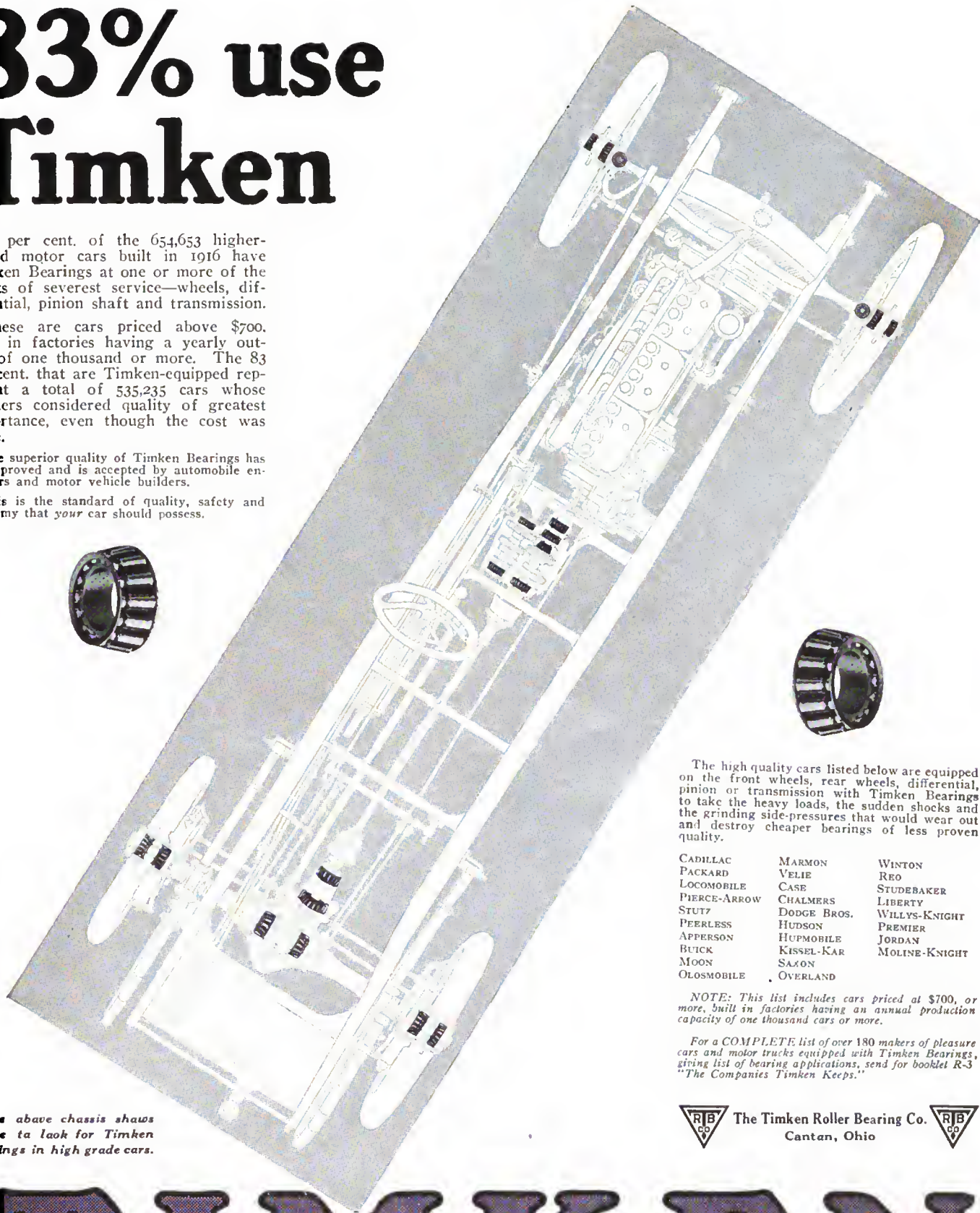
# 83% use Timken

83 per cent. of the 654,653 higher-priced motor cars built in 1916 have Timken Bearings at one or more of the points of severest service—wheels, differential, pinion shaft and transmission.

These are cars priced above \$700. built in factories having a yearly output of one thousand or more. The 83 per cent. that are Timken-equipped represent a total of 535,235 cars whose builders considered quality of greatest importance, even though the cost was more.

The superior quality of Timken Bearings has been proved and is accepted by automobile engineers and motor vehicle builders.

This is the standard of quality, safety and economy that your car should possess.



The above chassis shows where to look for Timken Bearings in high grade cars.

The high quality cars listed below are equipped on the front wheels, rear wheels, differential, pinion or transmission with Timken Bearings to take the heavy loads, the sudden shocks and the grinding side-pressures that would wear out and destroy cheaper bearings of less proven quality.

CADILLAC	MARMON	WINTON
PACKARD	VELIE	REO
LOCOMOBILE	CASE	STUDEBAKER
PIERCE-ARROW	CHALMERS	LIBERTY
STUTZ	DODGE BROS.	WILLYS-KNIGHT
PEERLESS	HUDSON	PREMIER
APPERSON	HUPMOBILE	JORDAN
BUICK	KISSEL-KAR	MOLINE-KNIGHT
MOON	SAXON	
OLDSMOBILE	OVERLAND	

NOTE: This list includes cars priced at \$700, or more, built in factories having an annual production capacity of one thousand cars or more.

For a COMPLETE list of over 180 makers of pleasure cars and motor trucks equipped with Timken Bearings, giving list of bearing applications, send for booklet R-3 "The Companies Timken Keeps."



The Timken Roller Bearing Co.  
Canton, Ohio



# TIMKEN

## ROLLER BEARINGS

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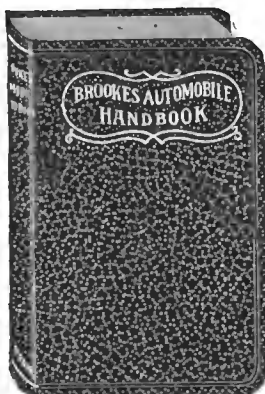
# TWO VALUABLE and USEFUL BOOKS

## Brookes' Automobile Handbook

ANSWERS YOUR NEEDS

Examination proves Brookes the most useful single book in the field of Motoring

715 Pages 335 Illustrations  
12 Tables  
Pocket Size, Bound in Leather  
Gold Stamping, Red Edges  
Price, postpaid, \$2.00



**As a Book** BROOKES' is universal in its scope. It contains 715 pages and 335 illustrations and diagrams, yet is of convenient pocket size. The flexible covers and the high quality of paper make this a satisfying book to handle, while the alphabetical arrangement of subject matter, together with an index of both main and sub-heads, renders the volume ideal for reference.

**As a Work of Reference** BROOKES' AUTOMOBILE HANDBOOK has for years been without an equal. In this, the fifth edition, two hundred and eighty-one of the articles give their subjects complete encyclopedic treatment. One hundred and forty of the articles cover more than one full page; fifty-six being between two and five pages in length; thirty-four from five to ten pages and fourteen more covering up to twenty-one pages for the single article. Among those subjects receiving most extended treatment are found. Eight and Twelve-Cylinder Engines, Carburetor Principles, Engine Principles, Batteries, Oiling, Ignition Principles, also Gray & Davis, Westinghouse, Delco, Bosch, Eisemann and Remy electrical equipment. A study outline from the pages of the Handbook shows the following:  
**The Automobile Power Plant**—Engine: Construction and Operation of Two and Four-Cycle Types. Valves: Poppett, Knight Sleeve, Rotary and Disc. Four, Six, Eight and Twelve-Cylinder Types, Combustion Chamber, Flywheel, Mufflers, etc., Camshaft.

### As an Encyclopedia of Automobiles

BROOKES' is complete from every standpoint. In addition to authoritative treatment of all those subjects that might be called standard, the wide diversity of the field covered is shown by the following list of fifty headings selected throughout the work:

- |   |                                       |
|---|---------------------------------------|
| Air, Relation of in Gasoline Mixture    | Gasoline, Thermodynamic Properties.   |
| Alcohol.                                | Heat of Combustion.                   |
| Aluminum Solder.                        | Ignition, Atwater Kent System.        |
| Ammeter Construction.                   | Ignition, Connecticut Battery System. |
| Anti-freeze Mixtures.                   | Ignition, Delco Battery Systems.      |
| Assembling a Car.                       | Ignition Remy Battery Systems.        |
| Automobile Driving.                     | Ignition, Westinghouse Systems.       |
| Backfiring.                             | Inertia.                              |
| Batteries, Starting and Lighting Types. | Kerosene as a Fuel.                   |
| Bendix Drive.                           | Magnetic Gear Shift.                  |
| Body Types.                             | Magnetic Transmission.                |
| Carburetor Adjustment (19 types).       | Magneto (ten makes).                  |
| Compression.                            | Offset Crankshaft Engines.            |
| Compressed Air Starters.                | Picric Acid.                          |
| Condensers.                             | Preignition.                          |
| Differentials.                          | Rotary Engine.                        |
| Electric Apparatus Cars.                | Shop Kinks.                           |
| Electric Meter Troubles.                | Starting and Lighting (16 makes).     |
| Engine, Knight Sleeve Valve.            | Tire Care and Repair.                 |
| Engines 8 and 12-Cylinder Types.        | Tire Vulcanizing.                     |
| Expansion of Gases.                     | Traction.                             |
| Flywheels.                              | Valves, Rotary, Disc, etc.            |
| Ford Magneto.                           | Valve Clearance.                      |
| Fuels for Automobiles.                  | Vacuum Fuel Feed.                     |
| Gasoline, Explosions and Fires.         | Units of Heat.                        |

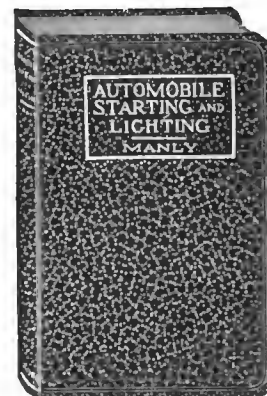
Brookes' Automobile Handbook adapts itself to your use, gives every advantage and service you ask. Its information is of lasting value, and the combination of reliability and unequalled service at such low cost makes its possession a real economy.

## Automobile Starting and Lighting

A Non-Technical Explanation of the Construction, Upkeep and Principles of Operation of the Electrical Equipment of Automobiles.

By H. P. MANLY

Pocket Size 302 Pages  
128 Illustrations  
Leather Gold Stamping  
Red Edges Postpaid, \$1.50  
Cloth, Ink Stamping  
Postpaid, \$1.00



**AUTOMOBILE STARTING AND LIGHTING** is a book designed for the electrical worker, whether expert or novice. The principles used from the very beginning, as well as those found for the first time in 1916, have been covered in detail, and the examples given are from the applications of these principles to the starting and lighting equipment of cars.

The result is a textbook of practical information, from which every unnecessary sentence has been eliminated by the arrangement adopted, yet which covers in detail all of the distinctive parts entering into twenty-four different makes of equipment now in use. An examination of the index with its three hundred and fifty references shows the following headings:

- |                |              |               |              |
|----------------|--------------|---------------|--------------|
| Adlaks         | Deaco        | Jesco         | Splitdorf    |
| Allis-Chalmers | Delco        | Loeca-Neville | U. S. L.     |
| Apico          | Disco        | North East    | Vesta        |
| Auto-Lite      | Dyneto       | Remy          | Wagner       |
| Bljur          | Entz         | Rushmore      | Ward Leonard |
| Bosch          | Gray & Davis | Simms-Huff    | Westinghouse |

The three hundred and two pages have been divided into nine chapters, each chapter treating of some one part of this work. The logical arrangement and completeness of the whole book is best realized by an examination of the following brief outlines of these chapters.

**Chapter I. Electric Lighting and Engine-Starting Equipment.** Requirements. The Charging System. The Lighting System. The Starting System. Types, Uses and Constructions of the Parts.

**Chapter II. Lighting Dynamos and Starting Motors.** The Operation. Construction. Upkeep. Care and Repair of the Current Generating and Starting Units. Dynamos: shunt, series, compound and reversed series windings. Armatures, brushes, fields, two-, four- and six-pole machines, output control, size and capacity. Starting Motors. Motor-dynamos. Ignition-dynamos. Double-deck Units.

**Chapter III. Batteries.** Action during charge and discharge. Charge and discharge rates. Charging methods. The Cell. Electrolyte. Plates: forming, paste, grids, etc. Capacity and Efficiency. Care, testing, voltage, etc. Troubles and Remedies.

**Chapter IV. Lamps and Wiring.** Uses of the Various Types of Bulbs, Reflectors, etc. Focusing and Cleaning. Dimming Methods. Single, Double and Three-Wire Systems. Switches, Fuses, Circuit Breakers. Distribution Panels, Junctions, Voltage, candlepower and amperage.

**Chapter V. Control Parts.** Cut-outs: electro-magnetic, hand and centrifugal. Tests and adjustment in details of various types and makes. Care and Repair.

Output Regulation. Amperage Control or Constant Voltage. Character-

istics of Each Class. Adjustments. Troubles and Remedies. Applications: constant voltage, constant speed. Inherent methods, amperage-hour meter, bucking coils, altered field connections, by battery voltage, carbon resistance, compound windings, iron wire system, line resistance, mercury wall, reversed series, third brush, vibrator systems.

**Chapter VI. Drive Methods and Starting Switches.** Single and Double Reduction. Ratio Required. Over-running clutch. Bendix Drive. Rushmore system. Magnetic switches. Magnetic gear shifts. Automatic and Planetary Gearing. Single and Double Contact Switches. Resistance Types, Commutating Switches. Motor Brush Switch. Motor-dynamo Switches.

**Chapter VII. Troubles and Remedies.** Systematic Methods of Location. Classification of Faults. Testing. Lighting. Charging and Starting Troubles. Regulation and Cut-outs troubles. Indicating Devices. Ammeters, voltmeters, voltammeters. Indicators. Targets. Pilot Lamps.

**Chapter VIII. Makes and Types of Equipment.** Auto-Lite. Dyneto and Entz. Gray & Davis. Remy. Delco. Disco. Westinghouse. North East, U. S. L., Bljur, Wagner, Bosch and Rushmore, Splitdorf, Simms-Huff, and Allis-Chalmers.

**Chapter IX. Explanation of Two Hundred Words and Terms Used in Starting, Lighting, Ignition and Electrical Repairing.**

Either or both of these books shipped postpaid on receipt of price indicated above

BOOK DEPARTMENT

THE CLASS JOURNAL CO., 239 W. 39th Street, NEW YORK

# PARK INTEGRALLY

## COUNTER BALANCED

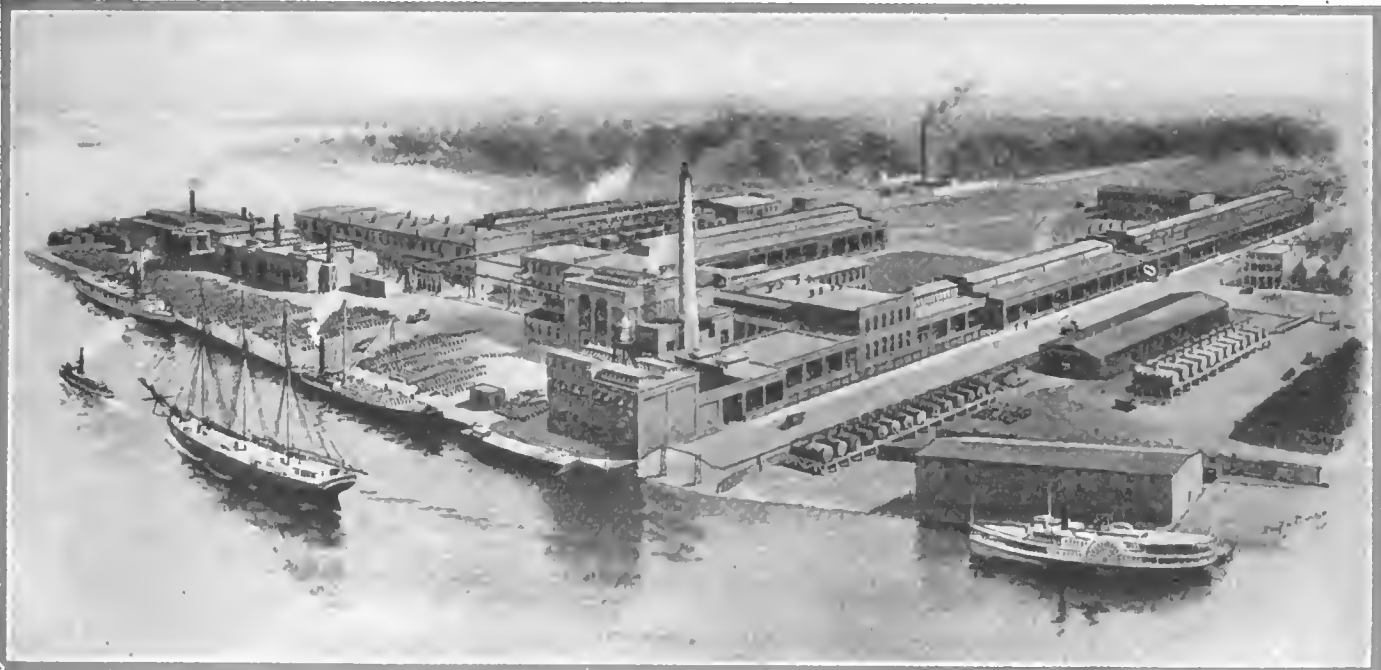
Patent Applied for



Quick Get-a-way  
Higher R. P. M.  
Reduced vibration  
Smoother running motor  
Eliminated bearing troubles

*We have shipped 34,187 Counterbalanced Crankshafts to February 6, 1917*

**The Park Drop Forge Co.**  
Cleveland



The Home of — **ZAPON** — Leather Cloth of Quality

New York, N. Y.

Detroit, Mich.

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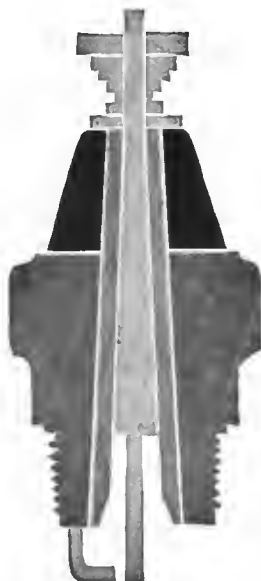


No gaskets, bushings, cement, or shellac hold the ANSWER Plug together.

*This absence of joints makes a gas-tight, leak-proof, ALL-POWERFUL Spark Plug.*

Notice the insulation of the ANSWER Spark Plug. Not washers, but sheets of mica are used. These sheets are wrapped on the inside of the shell, and extend from end to end of the plug. It is the ONLY plug so thoroughly insulated. Short circuiting is impossible. Breakage is out of the question.

This simple, sturdy plug means



*The* **ANSWER** SPARK PLUG

Made in all sizes for all motors

Price \$1  
Special for Fords  
75c

long life and perfect spark plug service. That is why the ANSWER is rapidly being adopted for the heaviest, hardest, most brutal service.

The ANSWER is a high grade mica plug that costs no more than ordinary porcelain or stone insulated plugs.

**Our 10,000 Mile Guarantee**

ANSWER Spark Plugs are guaranteed for at least 10,000 miles of perfect service. Our experience has proved that any ANSWER plug that will give this amount of service is good for 5 or 6 times as much—but if it doesn't go 10,000 miles you get a new plug free!

*Write for a booklet.*

**DEALERS!** Here is a most efficient mica plug that YOU can talk about. Its construction appeals to experienced motorists—and it gives the service.

*Write for Discounts—Today*

**HILBORN CO., Inc.**  
545 Canal Street New York City

USED BY FIRE DEPARTMENTS THROUGH OUT THE UNITED STATES

FOR LEAKY CYLINDERS





FOR POWER & SPEED  
EVER-TIGHT LEAD

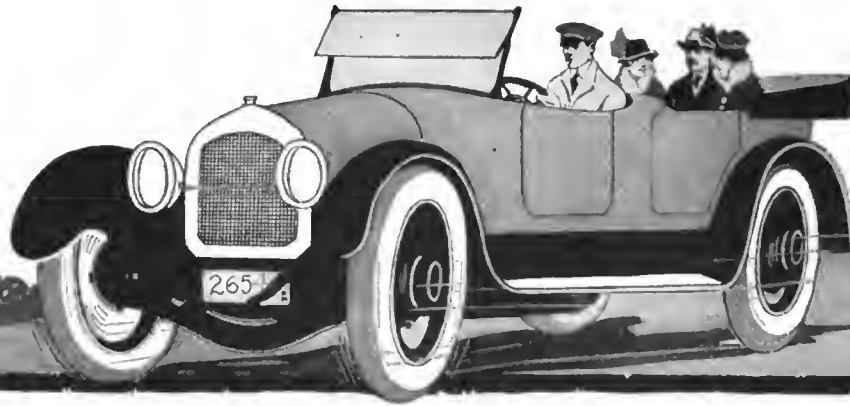
# EVER-TIGHT PISTON RINGS

Give your car more power by installing EVER-TIGHT Piston Rings. The great flexibility, due to three-piece construction, makes reboring of out-of-round cylinders absolutely unnecessary. Ask your dealer.

**Ever-Tight Piston Ring Co.** 1428 Chestnut Street Saint Louis, Missouri

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**It's Great  
to Feel Sure  
of Your Motor!**



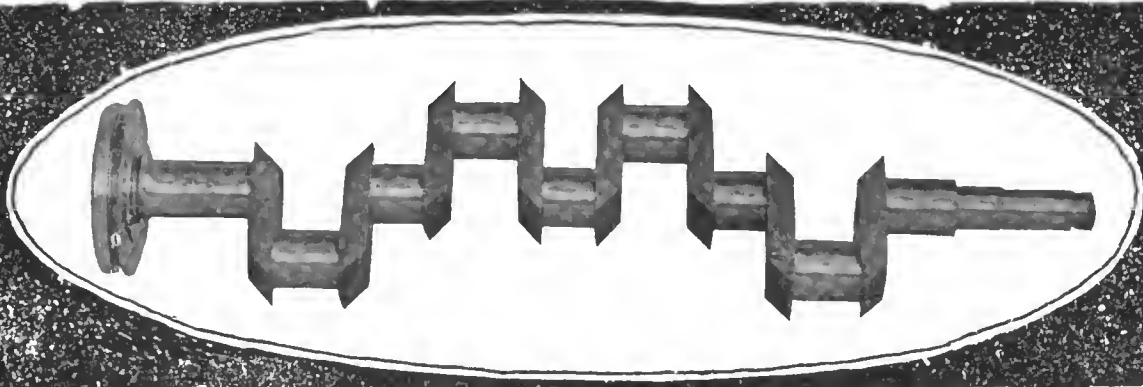
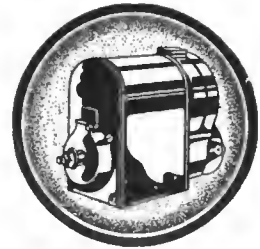
When you KNOW every explosion will give you ALL its power—that's when motoring is solid satisfaction. The

# EISEMANN

MAGNETO

makes complete combustion certain. It drives its intense, penetrating spark through the densest compression. Mixture rich or lean, motor racing or barely turning over, you'll be sure of full power if your car is Eisemann equipped!

**THE EISEMANN MAGNETO COMPANY**  
Sales and General Offices, 32-33d St., Brooklyn, N. Y.  
Detroit, Mich., 802 Woodward Ave.



## **MOLTRUP'S MACHINED CRANKSHAFTS**

• **Quality Production Assured** •

WE FINISH CRANKSHAFT FORGINGS for practically all sizes of motors.

OUR NEW FIREPROOF PLANT is equipped with the most up-to-date crankshaft machining devices in the country.

OUR LATHES AND GRINDERS ARE ALL new, insuring the most accurate work so far as alignment and balance is concerned.

TWENTY YEARS' EXPERIENCE HAS made us experts in this line and our work is of the highest quality possible to obtain.

Note:—Our capacity has been increased and we are now planning our 1917 production. May we submit an estimate on your work?

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Don't ever think that the beautiful, original finish on your car didn't come out of *your* pocket. Cost the maker a *mint* to get that finish on—and it's worth every cent he charged you.

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Because with the patented pole shoes

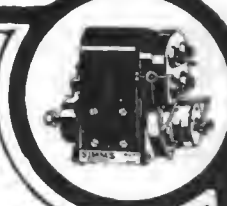
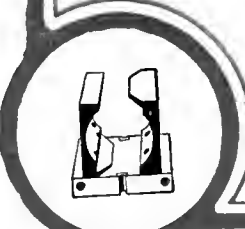
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**SIMMS**  
MAGNETOS

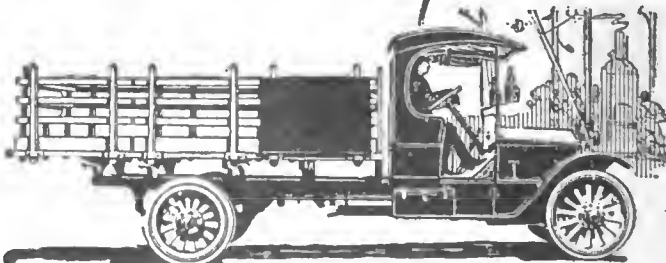
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**Type "A"**—Gears and case hardened parts.

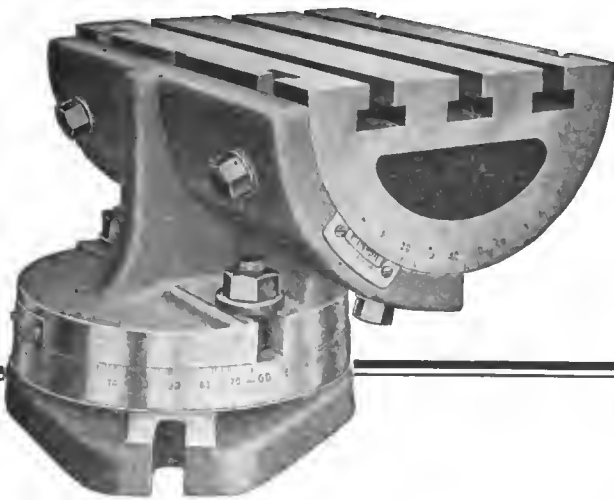
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**Type "AAA"**—Crankshafts, clips, drive shafts, axles.

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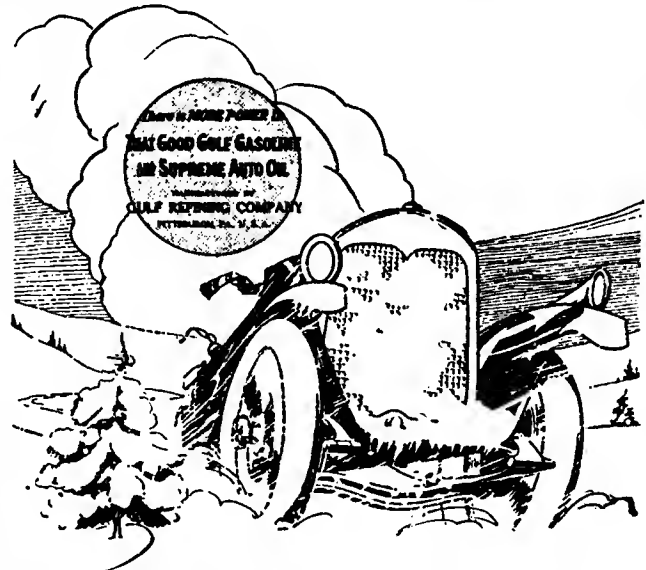
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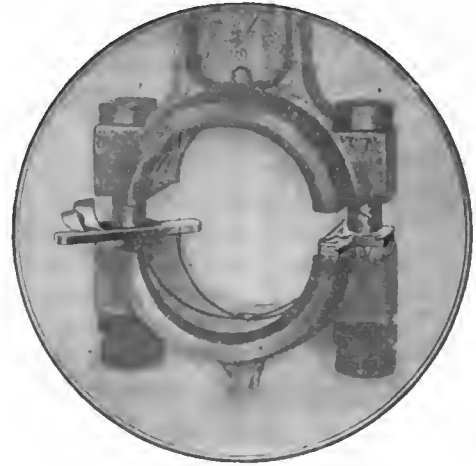
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is some job—and a hard job to do well.  
Laminated Shims make it 50% easier.

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More Accurate  
More Durable

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can be handled like a solid shim, but does not have to be filed. It is made up of leaves of sheet brass, held together by a metallic binder. You put the point of a knife under the edge of a leaf and peel it off.

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"Make Old  
Cars Look  
Like New"

### AUTOMOBILE SPECIALTIES

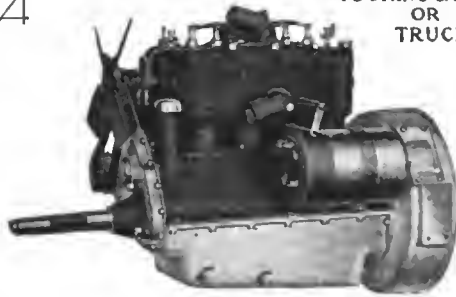
Spring-time suggests cleaning-time—shining-time for your automobile. With the winter months passed, every used car needs brightening up. There's a Peerless Specialty below for every worn part.

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FOR THE LIGHT ROADSTER  
TOURING CAR  
OR  
TRUCK

Used by leading manufacturers of best-known American-made light trucks.  
The business of manufacturing Le Roi Engines, formerly conducted by Milwaukee Machine Tool Co., is now carried on by

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Use the facilities of this perfectly equipped plant for the production of small sheet metal stampings of any design, also


**BRASS CASTINGS**  
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Contains no acid, lye, sal soda, caustic, soap, washing powder, grease, fat, or oil.

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OAKITE will not injure skin or clothing, wood, rubber or metal.

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Send for Detailed Information **THIRTY DAY TRIAL OFFER**  
Write for details of our offer to send a barrel of OAKITE on 30 days' trial subject to the terms of our Positive Guarantee.



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Electric Auto-Lite equipment for automobiles is as famous for the service that backs it as for the reliability and economy of its operation.

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Fit Every Demand

There are BEAVER Motors in a variety of sizes, suitable for all pleasure car and commercial car requirements. Meet all demands for power, economy and dependability.

Over-head valves. 20% to 25% more power than other motors of same bore and stroke.

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4-Cylinder—4-Cycle

Complete Line of

**GREASE CUPS, OIL CUPS AND OIL HOLE COVERS**

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Savings made please your patrons and pay good substantial profits

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Dissolved Acetylene  
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**Ignition**

**For Your Car**

Atwater Kent Mfg. Works  
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NUMBER 419

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**92%**  
 Efficient at all speeds regardless of road conditions



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Prodiium is a discovery, exclusively used by Republic, that makes the tires tougher; that wears as slowly, smoothly and evenly as a fine piece of steel.

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The demand for Republic tires, constantly increasing, the better wear and longer life; the light service requirements that keep you and your customer happy, are reasons that make Republic dealership more desirable than ever.

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Made in the famous **STAGGARD**, and Plain Treads  
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**REPUBLIC**  
**PRODIUM**  
**PROCESS TIRES**





Our **UNIVERSAL** Quality  
is  
*Your Eventual Economy*

The  
**Hartford Automobile Parts Company**  
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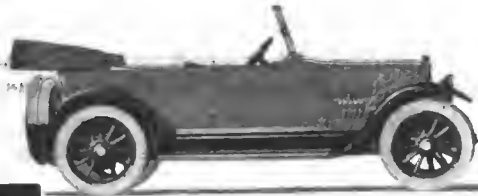
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Our Engineering Force At Your Disposal



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The car of a Hundred Quality Features, that created a stampede among critical car buyers 48 hours after it was first announced.

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EVERY INCH A CAR

**CHASE**

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is obtained when your Ford is equipped with  
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TRADE MARK REGISTERED  
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"Iron" the Road for Fords. Over 100,000 in use. They make your Ford ride like a heavy, expensive car. "Cantilever" construction, giving differing tension on upward and downward thrusts, eliminates rebound. Steering always easy. Reducing vibration, saves wear on tires, engine and transmission. Your dealer can attach quickly. Guaranteed for life of car. Write for our booklet. *It tells what Aitchandees will do for your Ford.*

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69-37

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is reliable—every championship race of 1916 was a Bosch Magneto Victory—every one. You can have that same reliability of ignition by simply insisting on Bosch.

*Be Satisfied* *Specify Bosch*

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THE BIGGEST CAR IN THE LIGHT WEIGHT CLASS

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*32 Horsepower, genuine cantilever springs. Big Body, Wide, Deep Seats. POWER and ENDURANCE.*

*Catalogue on request*

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They are not even cheaper. In the long run they cost you more. The best, the most durable, the most efficient electric tools on the market are

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Both Drills and Grinders fitted with Universal Motors for use with alternating or direct current. Can be operated from either lamp socket or power circuit. Equipped with Ball Bearings.

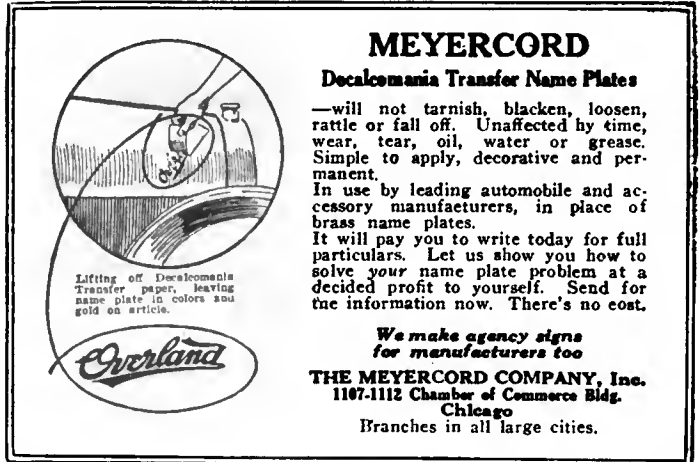
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## The "Standard" Electric Tool Co.

Cincinnati, Ohio, U. S. A.

New York Office 1328 Broadway



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—will not tarnish, blacken, loosen, rattle or fall off. Unaffected by time, wear, tear, oil, water or grease. Simple to apply, decorative and permanent.

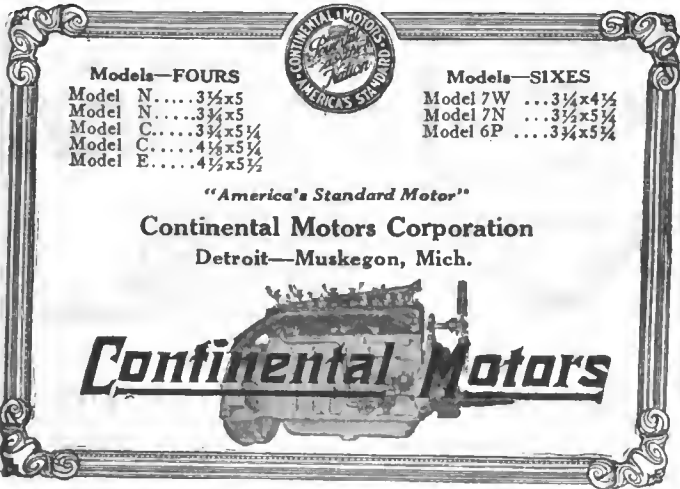
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Distinctive types of electric headlights for all cars. Lights that identify your car. Built by the largest manufacturer of automobile lamps.



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That Brings Down  
Gasoline Expense**



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The official world's records made by the New Stromberg in gasoline mileage prove that you need the New Stromberg on your car. Mail coupon for details of how the New Stromberg will reduce your gasoline bills.

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CARBURETOR**



**LYCOMING MOTORS**

Nothing in the World like it - for Power-

Lycoming Foundry & Machine Co.  
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Electric Starting and Lighting Systems

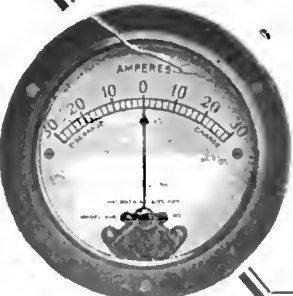
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Booklet on Special Ford Equipment

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MODEL 354 AMMETER

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They follow closely the lines of the preceding series, and the only changes are in the nature of refinements.

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- 22-73 Sporting
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NITROJECTOR No 100

THE 100% PERFECT SPOTLIGHT

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Complies with all laws for no-glare devices. Other dependable Old Sol Spotlights are No. 70—\$7.00, No. 77—\$5.00. Ask for Old Sol for Safety.

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**WARD LEONARD**  
26 YEARS EXPERIENCE  
**DYNAMO CONTROLLERS**  
FOR LIGHTING AND STARTING SYSTEMS

WARD LEONARD ELECTRIC CO.  
MT. VERNON, N. Y., U. S. A.

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NON-FLUID OIL facilitates the working of gears and bearings because it is thoroughly pure—contains no non-lubricating ingredients—and never changes its consistency.

**NON-FLUID OIL**

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Flexibility—approached in other cars—is actually attained in the Owen-Magnetic.

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**NEW PROCESS DIFFERENTIALS and ACCURATELY CUT METAL GEARS**

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**PITTSFIELD Spark Coils**

by continued tests and long service under severe working conditions, have demonstrated their absolute reliability. Produce a hot, flaming spark, with minimum current consumption, and so increase the life of your battery. Switches never short-circuit. Greatest frequency vibrators, with positive make and break at all times.

**PITTSFIELD SPARK COIL CO., PITTSFIELD, MASS.**

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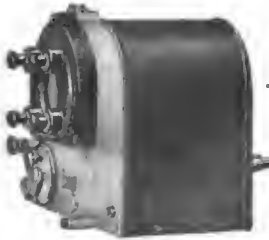
KNOWN the world over as the zenith of carburetor efficiency. A long list of American builders of cars, trucks and aeroplanes believe this simple, plain tube device to be the best insurance for permanent carburetor satisfaction.

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The Roller Bearing for Automobiles

Under Nearly Every Hood  
**ECLIPSE-BENDIX  
 DRIVE**  
 Transmits Starting Power  
 on 125 Makes of Automobiles  
**ECLIPSE MACHINE CO.**  
 ELMIRA, N. Y.

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 Brake Lining**  
 IT  
**WEARS  
 IT'S  
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Without Batteries  
 a Model T or TK  
**K-W MAGNETO**  
 will start any automobile or truck motor—on first lift of crank. Operates on inductor principle. Oil, dirt and oil-proof construction. Operates any number of cylinders up to 12. Write for catalog and full information.

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 Fires Any  
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**THE K-W IGNITION CO.**  
 2833  
 CHESTER AVE. CLEVELAND, OHIO, U.S.A.

**Economical Transmission**  
 Rockwood  
 Friction Transmission

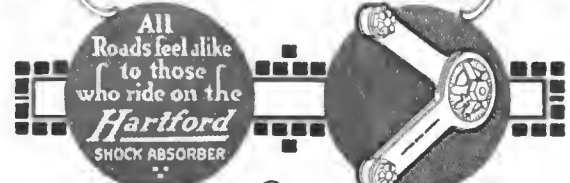
is more economical than the gear type—gears must constantly be kept running in grease. The complicated mass of cogs and other moving parts in a gear transmission is bound to wear. In friction transmission, there is nothing to wear out, except the fibre ring on the drive wheel. To replace this ring costs less than the cost of grease used up in the gear type.

**Fibre Friction—Filler Repairs**  
 We furnish friction fillers for all friction transmission. When writing, give the name of the car, the model, and if possible, the approximate inside and out diameter with the face of the fibre ring.

**Send For Our Free Book "Friction Transmission."** It contains valuable data and formulae for the engineer, designer or manufacturer. Mention occupation and firm connection when writing.

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**MAKES EVERY ROAD A BOULEVARD**



All Roads feel like to those who ride on the **Hartford SHOCK ABSORBER**


*Try it before you buy it. Satisfaction or money back.*

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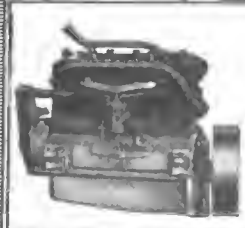
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**\$1095**

You buy the Liberty because of positive proof of its superiority.

If your territory is not closed address:  
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**Waukesha** **TRUCK MOTORS**  
 TRADE-MARK REG. *The Exceptional Motor*




**CHROME NICK EL STEEL**  
 for strength—aluminum for lightness make Waukesha Truck Motors exceptionally efficient, long of life and free from troubles. Write for catalog L which gives full details.

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**Speedway Tires**

For quality, stamina, strength and general dependability, just test a NATIONAL "Speedway" against the tires you are now using.

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of the Automobile Industry

*For Second-Hand Cars, Surplus Parts, Accessories, Tires  
Machinery & all other Special Announcements of a Similar Character*

## BEARINGS (DIE CAST)

TO FIT

Chalmers

Each Net

Conn. Rod 40-07*-08-09 (Half).....	\$1.00
C. S. Front 40-07-08-09 (Sleeve).....	2.00
C. S. Center 40-10-11 (Half).....	1.10
C. S. Rear 40-07-10-11 (Sleeve).....	2.50
Conn. Rod 30-09-10-11 (Half).....	.70
Conn. Rod 36-12-13-14 (Half).....	.70
Conn. Rod (Master Six) (Half).....	.70

Hudson

Conn. Rod M/20-09-10 (Half).....	.90
C. S. Front M/20-09-10 (Sleeve).....	2.00
C. S. Rear M/20-09-10 (Half).....	1.75
Conn. Rod M/33-11-12 (Half).....	.70
C. S. Front M/33-11-12 (Sleeve).....	2.50
C. S. Rear M/33-11-12 (Sleeve).....	2.50

R. C. H.

Conn. Rod 12-13-14 (Half).....	.60
C. S. Front 12-13-14 (Sleeve).....	1.75
C. S. Rear 12-13-14 (Half).....	1.50

Stoddard Dayton 20 H. P.

Conn. Rod (Half).....	.70
C. S. Front (Sleeve).....	2.00
C. S. Rear (Half).....	1.20

Abbott 30 H. P.

Conn. Rod 13-14-15 (Half).....	.70
C. S. Front 13-14-15 (Sleeve).....	1.75
C. S. Rear 13-14-15 (Sleeve).....	2.00

Alco (Taxicab)

Conn. Rod 10-11-12 (Half).....	1.00
C. S. Front 10-11-12 (Half).....	1.25
C. S. Center 10-11-12 (Half).....	1.10
C. S. Rear 10-11-12 (Half).....	1.75

Oldsmobile 1916 M/42

Conn. Rod (Half).....	.60
C. S. Front (Half).....	.70
C. S. Center (Half).....	.75
C. S. Rear (Half).....	.80

Grabowsky Truck

Conn. Rod (Half).....	.75
C. S. Front (Sleeve).....	3.00
C. S. Rear (Sleeve).....	3.00

**Bearings listed are in stock for immediate delivery.**

**Absolutely Brand New Parts, We do not handle Junk.**

If you have trouble in getting Bearings to fit your crankshaft, which has been turned down, send us sample of what you require with Micrometer Measurements of part, and we will make same and ship within 24 Hours after receipt of sample; we only use Parsons White Brass, No Babbitt.

Bulletin No. 1

**J. C. Gorey & Co.**  
354 West 50th Street, New York

## OF UNUSUAL INTEREST

AUTO NEEDS CO.

We wish to call special attention to our address,

1602 S. Michigan Ave.

where we are offering such marvelous bargains that you cannot afford to overlook them.

For the benefit of our out of town patrons we deem it proper to state that MICHIGAN AVENUE is the principal thoroughfare for the AUTO TRADE in CHICAGO, and that it is on the SOUTH SIDE.

We have never had any offices or stores on Jackson-bd., or anywhere on the WEST SIDE of CHICAGO.

OBSERVE OUR SMASHING PRICES.

Prest-O-Lite tanks, size B.....	\$6.00
Bosch H. T. magnetos.....	17.00
Aluminum steering wheels.....	1.00
Rexo motor horn.....	2.00
Clero hand horn.....	1.55
Kellog air pumps.....	6.00
Stewart vacuum tanks.....	5.00
3/4 in. Mosler spark plugs.....	.20
6 in. headlights (electric), pair.....	1.50
8 in. headlights (electric), pair.....	2.00
Tail lights (electric).....	.90
Reinners, all sizes.....	1.00
Tire flaps, all sizes.....	.20

HIGH GRADE NEW TIRES AND TUBES HERE LISTED AT SACRIFICE PRICES. ALSO USED TIRES AND TUBES WE PROCURE FROM AUTOMOBILES WRECKED FOR PARTS.

	New Tires	New Tubes	Slightly Used Tires	Slightly Used Tubes
28 by 3.....	\$6.00	\$1.50	\$3.00	\$1.00
30 by 3.....	6.50	2.00	3.50	1.10
30 by 3 1/2.....	8.00	2.25	4.25	1.25
31 by 3 1/2.....	8.50	2.50	4.90	1.25
32 by 3 1/2.....	9.00	2.40	5.25	1.40
34 by 3 1/2.....	9.15	2.45	5.50	1.50
36 by 3 1/2.....	10.75	2.65	6.25	1.50
30 by 4.....	9.20	2.80	6.50	1.50
21 by 4.....	11.75	2.75	6.25	1.55
32 by 4.....	11.95	2.90	7.00	1.55
33 by 4.....	12.60	3.00	7.25	1.60
34 by 4.....	13.10	3.15	7.75	1.60
35 by 4.....	13.50	3.35	7.25	1.70
36 by 4.....	14.00	3.45	7.50	1.75
37 by 4.....	18.25	3.75	8.70	1.85
34 by 4 1/2.....	16.00	3.85	7.90	1.75
35 by 4 1/2.....	16.50	3.90	7.90	1.80
36 by 4 1/2.....	16.80	4.00	8.00	1.85
37 by 4 1/2.....	17.25	4.15	9.25	1.90
35 by 5.....	16.40	4.45	8.00	1.90
36 by 5.....	17.80	4.55	9.10	2.00
37 by 5.....	19.25	4.85	9.50	2.10
37 by 5 1/2.....	26.70	6.35	11.50	2.75

10% more for nonskid.

Owing to the steady advance of the rubber and tire markets we earnestly recommend that you send us your order at once, as we will not be able to sell our goods at prices quoted in this list much longer.

One dollar or deposit sufficient to defray express charges required with each mail order. SHIPMENTS PROMPTLY MADE SUBJECT TO YOUR INSPECTION; BALANCE C. O. D.

AUTO NEEDS COMPANY

1602 S. Michigan Ave., Chicago, Ill.

Formerly Auto Sales & Parts Co.

Parts and Repairs

TO ALL OWNERS OF

Maxwell-Briscoe

Maxwell 6-50

Maxwell 4-35

Flanders "Six"

Stoddard-Dayton

Everitt

Brush

Courier-Car

Columbia

Courier Clermont

Sampson "35" Motor Cars

Alden-Sampson Trucks

The Maxwell Company has transferred to the Standard Motor Parts Company the entire Service Department on all of the models above listed, and all orders for repair parts should be placed direct with the Standard Motor Parts Company, New Castle, Indiana.

Better service will be given these owners than ever before, and many reductions in repair parts prices have been effected.

Address all orders and inquiries direct to the

**Standard Motor Parts Company**

NEW CASTLE, INDIANA

## AUTO PARTS

FULL STOCK OF PARTS FOR

**MICHIGAN LOZIER**

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We maintain a complete stock of parts for the above cars

Philadelphia Machine Works

67 Laurel Street Philadelphia, Pa.

Please mention The Automobile when writing to Advertisers

## OUR BARGAINS

not only include automobile parts but every necessary accessory. In fact, most complete stock in America.

### RADIATORS

Regal 1913	\$31.00	Halladay 1912	\$30.50
Regal S	31.00	Cartercar M	28.00
Regal F	31.00	Mitchell 4-40	27.50
Vette 4-1915	32.00	American 6-66	15.00
Overland 38	31.50	Midland 12	30.00
Buick F	30.50	Midland 6-1911	30.00
Buick 36 C	36.80	Pullman 4-44	29.00
Buick D	30.50	Maxwell Mascot	33.00
Buick 37	36.80	Staver	36.00
Buick 36	36.80	Elmore 37	30.50
Hudson 54-1914	42.00	Imperial 34	42.00
Liberty	25.00	Colby	25.00
Pierce-Arrow	\$30.00		

### MOTORS

Milwaukee 4-cyl. 40 HP. unit power plant with transmission	\$175.00
Yankee 4-cyl. Atwater-Kent ignition, carburetor with fan	70.00
Herff-Brooks 6-cyl. 45-50	200.00
Marion 40 HP	150.00
Piggina 4-cyl. T head	150.00

These motors are all new and in perfect condition. Measurements and description furnished on request.

### TRANSMISSION

3 speed selective type	\$50.00
Planetary	20.00

### CARBURETORS

Stromberg K O 1"	12.00
Schebler Model L 1 1/4"	12.00

### SPECIAL

Kellogg 1 cyl. engine driven pumps	\$6.00
Kellogg 4 cyl. engine driven pumps	12.00

### SERVICE DEPT.

Is equipped for all kinds of welding and magneto repair work. Write for our 1917 catalog.

## AUTO PARTS CO.

No Branches

731 W. Jackson Blvd. Chicago, Ill.

## ORPHAN CARS

FOR WHICH PURITAN MACHINE CO. SUPPLIES PARTS

Acme, Anstin, ABBOTT, Areocar, Alpena, American, Underslung, Alco, Argo, Atras, Barnes, Benham, Bergdoll, Brnab, California, Carnation, Cinco, Continental, Carhart, OARTERCAR, Carthage, Century, Clark, Colby, Conier, Crosecat, Cricket, Crow, Croxton-Keeton, Cutting, Dart, Dragon, Dayton, De Luxe, De Tumble, Demot, Dnrocar, Elmore, Ewing, Everitt, F. A. L. Car, Grnbowsky, Gramm, Grout, Garford, Haver, HENDERSON, Herreshoff, Halliday, Henry, Hazard, Keeton, KRIT, Kline, Lozier (old models), Lion, Little, Lexon, Marathos, Marion, Marquette, Maxwell (old model), MICHIGAN, Midland, Miller, Mason, McIntyre, Monarch, Nyberg, Northern, Northwestern, Ohio, Oliver, Omaha, Owen, Packera, Palmer-Singer, Penn-Thrifty, Poss, Parry, Pungs-Fluch, Palge (8 cyl.), Fern, Pennsylvania, Queen, E. O. H., Raniar, Randolph, Rspid, Reed, Relabia Dayton, Reliance, Rider-Lewis, Royal Tourist, Scripps-Booth Cycle, Seldan (pleasura), Southern, SPEEDWELL, Standard, Staver, Stoddard-Dayton, Snturban, Thomas-Detroit, Van Dyke, Warren-Detroit, Wahl, Whiting, Wayne, Welch-Detroit, Welch-Pontiac.

We've over 2,000,000 service parts and accessories. Write for the Puritan Bargain Bulletin.

## PURITAN MACHINE CO.

All Parts for All Cars.

408 Lafayette Blvd. Detroit, Mich.

### PEUGEOT TYPE Cylinder Head for Fords

16 Overhead Valves, Rocker Arms, Push Rods. Special Intake Manifold for 1 1/4 in. Carburetor. Complete assembled \$75.00 f.o.b. Anderson, Ind.

ROBERT M. ROOF, M. E.

# Big Bargains in Auto Parts

We have in stock, ready to meet your wants, Pistons, Axles, Cylinders, Magnetos, Motors, Lamps and everything in the auto line at

## One-Half the Manufacturer's Price

We sell only parts that are serviceable and if our parts are unsatisfactory, we will cheerfully refund your money.

Our list of satisfied customers is rapidly growing larger and this is the result of our better service methods. We can fill your order and ship to you in less than four hours.

**FREE** Our Price List will be mailed to you on request.

## Auto Salvage Co.

3 East 17th St., Kansas City, Mo.  
Largest Auto Part Dealers in the Country

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Flanders 20	75.00	Ovarland 31	75.00
Rambler Mod. 44	50.00	Rosal 30	80.00
Carter Car 1911	75.00	Evrett 30	85.00
Reo 1911	50.00	E. C. H.	85.00
Stearns 1911	75.00	Kissel 50 HP	75.00
Studebaker 4 cyl.	90.00	Bluck 17	90.00
'15 with starter	150.00	Kissel Six	100.00
Bergdoll 30, Mod. O, Unit Power Plant	90.00		
Jackson 40, Unit Power Plant	90.00		
Chalmers, Mod. K, Unit Power Plant	100.00		
King 1914, Unit Power Plant	150.00		
Lexington 1914, Unit Power Plant	150.00		
Auburn 1916, Unit Power Plant	175.00		

All Motors guaranteed in good shape.

### MAGNETOS

Bosch D4	17.50
Bosch DU4 or DR4	80.00
Bosch D6	80.00
Bosch DU6-DR6	85.00

### REPAIRS

We have them for most any make. We save you 50 to 75%. Money Refunded on Goods Not Satisfactory.

## Auto Wrecking Co.

We Tear 'Em Up and Sell The Pieces.

13th and Oak Kansas City, Mo.

## The LOST Is FOUND

That's what our service means to those profit seekers when they become acquainted with Puritan stock completeness and efficiency. Tell us your story—and get our Bargain Bulletin—it will help you out.

**Bodies**—New Clover Leaf Type Bodies, split front seats, upholstered and painted. Fit many makes of cars, \$125.00. Other bodies, many sizes and types, both Roadster and Touring. Send for measurement chart, \$15.00 to \$75.00.

**Chassis**—Remington with Perkins Unit Power Plant full floating rear axle. Spicer universal joint, wheels, fenders and running boards, complete, \$150.00. Cartercar Model 8 Chassis with Northway Unit Power Plant fenders, running boards, wheels and tires—in good shape, \$175.00.

**Frames**—All sizes at \$10.00.

**Motors**—Bever Unit Power Plant six cylinder 40-00 hp., \$175.00. Perkins 4 cyl. 18 hp., \$80.00. We supply repair parts for over one hundred Orphan Cars.

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All Parts for All Cars

408 Lafayette Blvd., Detroit, U. S. A.

## Save 50% to 75% on Auto Repair Parts

We have all parts for following cars and others not listed:

Cadillac, 1909 to 1913	Moon 30-40-45
Chalmers—36-40	Maxwell, all models to 13
Studebaker—Garford.	Packard, 1905 to 1911
E.M.F.—Flanders.	Pierce-Arrow, '07 to '09
Dorria, 1906 to '09	Ohio—Hudson, 20 to 33
Peerless, 1906 to '13	Berdoll-Staver
Regal—Stevens Dnryea	Krit 20—Atlas
Henderson—Speedwell	Mitchall, 1903 to '13
Stearns, 30 to 60	Thomas, all models
Kissel 6—Matheson	Great Western—RCH
Amplex, all models	Olimobile Special Ltd.
Oakland-Selden	Marmont—Carter Car
Interstate—Jackson	Overland 33-40-41-42-45-
Reo, 1908 to '13	46-51-52-54-55-56-59-
Locomobile	60-69-71
Buick, 10-17-27-31	

**COMPLETE MOTORS**—Best makes, tested and in good running condition \$35 to \$175. **BEARINGS**, including Timken, Hess-Bright, Hyatt-Roller, etc., 50c to \$7.00. **CARBURETORS**—All makes \$3 to \$9. **MAGNETOS**—Bosch, Elsemann, Splitt-dorf, Remy, etc., \$10 to \$32.50. **GOOD AUTO WHEELS**—All kinds from standard cars \$2 to \$7. **AUTO SPRINGS**—\$2 to \$5.

## Maxwell Bros. Auto Salvage Co.

3921-33 Olive Street St. Louis, Mo.

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For All Makes. Pleasure and Commercial. Your Sample Will Bring You a Duplicate

### TRUCKS

Whites, 1/2, 1 1/2 ton and 3 ton. White 5-ton mechanical dump, newly painted and overhauled, two years old, \$2,000.00 to first buyer; Sauner chassis, 3 ton, newly painted, \$1,000.00; Selden, 2 ton, \$550.00; Universal 2 ton, \$475.00; Alco, 1 ton, \$375.00; Alco, 3 1/2 ton, \$700.00; Packard, 3 ton, \$775.00; Packard, 5 ton, dump, two years old, \$1,300.00; Mack chassis, 1 ton, 2 ton, 3 ton and 5 ton dumpers, \$1,250.00; Gramm 3 ton, \$500.00; Gramm 5 ton, \$800.00.

### TRUCK PARTS

White 5-ton wheels. Differential, jack shafts, rear axles, springs, 1 1/2-ton and 5-ton truck frames and new truck steering posts.

### WORM DRIVE

Rear axles, 2-3-5—Sheldon, David Bronn. Best opportunity ever offered.

### TOURING CARS AND CHASSIS

Pacific Motor Car Exchange Co.  
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## Pope-Hartford Parts

Parts for all models of Pope-Hartford Pleasure Cars, Trucks and Public Service cars—made from the original drawings and patterns, with the original tools, fixtures, etc.—complete stock always on hand, prompt and satisfactory service.

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for over 100 MAKES OF CARS

Obsolete, Orphan and Current models. General line of repair parts for old Maxwell cars, at old list price.

NO SECOND-HAND PARTS OR JUNK  
OUR PARTS ABSOLUTELY NEW

DEALERS AND REPAIRMEN, get our price list, and make a profit on your repair parts

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We have on hand a miscellaneous lot of PARTS for every make of car.

### THE AUTO PARTS CO.

1429-31 Race Street Philadelphia, Pa.

## A New 128 Page Catalog

Just off the Press, will be sent you free upon request

### BARGAINS IN MOTORS RADIATORS SUPPLIES

In Fact, Everything for the Automobile

Write today for our Catalog

**AUTOMOBILE APPLIANCE CO.**

1438 Michigan Ave., Chicago, Ill.

## LAST CALL

We have a large assortment of TOURING BODIES that we will close out at very low prices. We can fit most any car—prices range from \$10.00 to \$40.00. Write for particulars.

**The M & M Company**  
Cleveland, Ohio

## OUR PRICES ARE THE LOWEST

Magnetos, Coils, Carburetors, Wheels, Axles, Gears, Motors, Transmissions, Tires and Tubes.

There is no second-hand part of an automobile that we cannot supply. Bosch Magnetos from \$10 up. Satisfaction guaranteed or money refunded. One aeroplane outfit—3 cylinder motor—\$50.

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## EXCLUSIVE OWNERS

of the

ORIGINAL Service Departments of

AMERICAN MOTORS CO.  
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HERRESHOFF MOTOR CO.  
L-P-C MOTOR CO.  
DE TAMBLE MOTORS CO.

We have the original patterns for the manufacture of all repair parts for all models of the American, Marion, Herreshoff, DeTamble and Lewis cars. Orders shipped the same day received. All parts absolutely new and standard at lowest prices. Satisfactory service guaranteed. Send for catalog.

WE HAVE NO AGENTS NOR BRANCHES

**American Motors Parts Company**

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## CONTINENTAL MOTORS

Unit Power Plant with Fuller

CONTINENTAL MOTORS

Unit power plant with Fuller trans., center control, cyl. cast en-bloc, L head, enclosed valves, 40 H.P., brand new, going at **\$160**

D 6 BOSCH MAGNETO dual 2 spark.....\$55  
New steering gears, Warner, and others for truck or passenger use from.....\$10 to \$15  
Fenders, blk. enm. crown, latest style, per set.....\$10  
Auto-Lite electric starter motors, new.....\$15

Auto-Lite lighting generators, new.....\$14  
Bosch magnetos, all models, from.....\$12 to \$38  
Bosch D U, 2 cyl. magnetos.....\$14  
Splittdorf 4 cyl. high tension E U type.....\$25  
Splittdorf 6 cyl. high tension Dixie.....\$25

We specialize in furnish parts in overhauling, also for rebuilding. Our prices always cheap.

**PROGRESS AUTO PARTS CO.**  
5121 Euclid Ave. Cleveland, Ohio.

## AUTOMOBILE PARTS

SAVE 50% AND MORE

WE HAVE PARTS FOR MOST ALL STANDARD MAKES OF CARS. WRITE US YOUR NEEDS.  
E M F 30 Krit Regals 1909 to 1914  
Maxwells Q.F.K.G&AA Cadillac 1909 to 1912  
Overland, 38, 42, 53 Mitchell 1907 to 1912  
Packard 1906 to 1909 Flanders 20 Warren 30  
Henry & Franklin Cole 30 Hendson 20  
Buick, 10, 17, 19 & 25 GLIDE Stoddard-Dayton  
Engines, Gears, Bearings, Axles, Crank Shafts, Cylinders, Transmissions, Hubs, Wheels for most any make of car. We will trade engines with you.

**AUTO PARTS CO.**  
4120 Olive Street St. Louis, Mo.  
No connections with any other Auto Parts Co.'s.

## Specialties for Fords

Stream-line Hoods, Radiator Shells and Crown Fenders, One-Man Tops, Touring Car, Roadster, Racing and Commercial Bodies. Wire and Wood Demountable Rim Wheels. Camping and Commercial Trailers. Special, low, factory-to-user prices. Send for catalogue.

**ACCESSORY MFG. CO.**

46-48 Kentucky Ave., Indianapolis, Ind.

## KRIT OWNERS

We furnish quick service on all engine, clutch, transmission, differential, front and rear axle steering gear, wheels, steering knuckles and cones, fenders, frames and body parts from original Krit Stock. For all models from 1909-1915 inclusive.

**MOTOR CORPORATION**

1309 Race St. Philadelphia, Pa.

## STODDARD DAYTON PARTS

DAYTON AUTO REPAIR CO.

355 West 52d Street New York City

ALL TYPES OF BEARINGS

The New Departure Service Stations

## THE GWILLIAM COMPANY

Engineers—Specialists in Bearings

Bearings for Orphan Cars

New York, 2 Columbus Circle (58th St. at Broadway)

Philadelphia, 1314 Arch St.

## GUARANTEED PARTS

at 1-2 List Price

Packard 30-08 to '12, Pierce 4 & 6 cyl. '08 to '12, Cadillac 4 cyl. 10 to '14, Buick, all models.

**BOSCH MAGNETOS**

All types of slightly used magnetos at your price. Guarantee them right. Your money's worth or your money back.

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FOR TRANSMISSIONS AND DIFFERENTIALS

Write our Sales Department about your requirements

**SERVICE GEAR & MACHINE CO.**

Reading Pennsylvania

## SERVICE COUNTS

We are prepared to make prompt delivery of Parts for most any make cars. Lowest prices. Send broken parts when ordering if possible.

Frest-O-Lite Tanks, \$5.00 and \$6.00. Bosch Magnetos, \$15.00 to \$20.00. Kant-hio Inner Liners, 50% off list. Standard Makes Guaranteed Tires and Tubes, 15% to 35% off list. 50% off on Seconds.

**I. Wolf Auto Parts & Tire Co.**

619 N. Illinois St., Indianapolis, Ind.

## Magnetos and Carburetors

All types magnetos, both high and low tension, from \$10 to \$15. All types of carburetors from \$2 to \$7. Parts on hand for all makes of cars.

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253 South Ave. Rochester, N. Y.

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All types of magnetos from \$5 up. Get them while they last. Parts for all makes of cars on hand. Sold at 50 per cent less than regular prices.

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 Send \$1 deposit for each tire ordered, and we will send the tire, balance O. O. D.

**CHICAGO D. T. CO., Mfrs.**  
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**NEW BLEMISHED TIRE BARGAINS**  
 (3,500-Mile Guarantee)  
 30x3.....\$6.00 34x4.....\$12.50  
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 We Double Tread your old tires and guarantee perfect satisfaction. Give us a trial.  
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 Non-Skid 10% Extra.  
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## DOUBLE TREAD TIRES GUARANTEED

for big, low cost mileage. They save you 65%. We build splendid double thickness tires by special process, giving you the unusual strength and resistance qualities so essential for heavy work in the country.

Three years ago we introduced **DOUBLE TREAD TIRES** to the farmer. Square dealing, honest values and prompt delivery have built the largest retreaded tire business in America around our "Doutre" trade mark. Compare these prices on tires and tubes. Send for booklet and detailed lists.

Sizes	Tires Plain	Red 9 Ply Tubes
30 x 3	\$4.50	\$3.00
30 x 3 1/2	6.00	3.60
32 x 3 1/2	6.25	3.65
34 x 4	7.75	5.00
34 x 4 1/2	9.50	6.60
35 x 4 1/2	10.00	6.75
36 x 4 1/2	10.00	6.90
37 x 5	12.00	8.20

All Sizes from 28 x 3 to 38 x 5 1/2 in Stock.

Tires, Fisk, Red and Gray Tops, and's. Special Prices.

20% Deposit Required on C. O. D.  
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## HERCULES TIRES GUARANTEED 4000 MILES

If a tire fails to run 4000 miles we will replace it with another tire for 1/2 regular price.

Size	Plain	Non-Skid	Tubes
28 x 3	\$ 6.95	\$ 6.35	\$1.30
30 x 3	8.50	7.50	1.90
30 x 3 1/2	7.75	6.95	2.15
32 x 3 1/2	8.95	9.90	2.25
34 x 3 1/2	9.90	10.45	2.35
31 x 4	11.45	12.60	2.95
32 x 4	11.95	12.95	3.05
33 x 4	12.45	13.50	3.10
34 x 4	12.95	13.95	3.20
35 x 4	13.45	14.95	3.30
36 x 4	13.95	15.50	3.35
34 x 4 1/2	16.95	18.95	4.00
35 x 4 1/2	17.45	19.45	4.10
36 x 4 1/2	17.95	19.95	4.15
37 x 4 1/2	18.45	20.45	4.25
36 x 5	20.25	22.95	4.95
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Fresh Selected Stock—Standard Makes Guaranteed

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28x3.....	\$ 6.00	\$1.50	34x4.....	\$13.75	\$3.25
30x3.....	6.50	2.00	35x4.....	14.00	3.45
30x3 1/2.....	8.50	2.25	36x4.....	14.50	3.60
31x3 1/2.....	9.00	2.50	34x4 1/2.....	16.75	4.00
32x3 1/2.....	9.50	2.50	35x4 1/2.....	17.50	4.15
34x3 1/2.....	10.90	2.55	36x4 1/2.....	18.00	4.25
36x3 1/2.....	11.25	2.75	37x4 1/2.....	18.50	4.35
31x4.....	12.25	2.90	36x5.....	18.00	4.90
32x4.....	13.90	3.20	36x5.....	19.00	5.00
33x4.....	13.25	3.25	37x5.....	20.50	5.30

Add 10% for non-skid.  
**Bargains in Slightly Used Tires**

Size	Used Tires	Used Tubes	Size	Used Tires	Used Tubes
30x3.....	\$ 3.50	\$1.25	35x4.....	\$ 8.00	\$1.75
30x3 1/2.....	4.25	1.45	36x4.....	8.00	1.75
31x3 1/2.....	5.00	1.50	34x4 1/2.....	8.50	1.75
32x3 1/2.....	5.75	1.50	35x4 1/2.....	8.50	1.80
34x3 1/2.....	6.90	1.60	36x4 1/2.....	8.75	1.85
31x4.....	6.75	1.65	37x4 1/2.....	10.00	1.90
32x4.....	7.50	1.60	36x5.....	9.90	2.00
33x4.....	7.75	1.70	36x5.....	10.00	2.00
34x4.....	8.25	1.70	37x5.....	10.25	2.20

All goods shipped O. O. D. subject to examination, on receipt of 10% of order.

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### Akron Tires at Cut Prices

You must know what Akron Tires are, if not it is time you did. We are now offering them at extremely low prices. Send in your orders at once.

Size	Plain	Non-Skid	Tubes
28 x 3.....	\$5.25	.....	\$1.50
30 x 3.....	5.50	\$6.75	1.90
30 x 3 1/2.....	6.95	7.50	2.15
32 x 3 1/2.....	7.95	8.75	2.25
34 x 3 1/2.....	8.95	9.75	2.35
31 x 4.....	9.95	10.60	2.95
33 x 4.....	9.95	10.85	3.10
34 x 4.....	9.95	10.95	3.20
36 x 4.....	10.95	11.95	3.35
35 x 4 1/2.....	12.95	13.95	4.10
36 x 4 1/2.....	13.50	14.50	4.15
37 x 5.....	15.95	16.95	5.05

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## A BIG SAVING IN TIRES—TUBES

Fresh Selected Stock—Standard Makes Guaranteed

Size	New Tires	New Tubes	Size	New Tires	New Tubes
28x3.....	\$ 6.00	\$1.25	34x4.....	\$13.75	\$3.25
30x3.....	6.50	2.00	35x4.....	14.00	3.45
30x3 1/2.....	8.50	2.25	36x4.....	14.50	3.60
31x3 1/2.....	9.00	2.50	34x4 1/2.....	16.75	4.00
32x3 1/2.....	9.50	2.50	35x4 1/2.....	17.50	4.15
34x3 1/2.....	10.90	2.55	36x4 1/2.....	18.00	4.25
36x3 1/2.....	11.25	2.75	37x4 1/2.....	18.50	4.35
31x4.....	12.25	2.90	36x5.....	18.00	4.90
32x4.....	13.90	3.20	36x5.....	19.00	5.00
33x4.....	13.25	3.25	37x5.....	20.50	5.30

For Non-Skid add 10% to All Prices. Special Bargains in Slightly Used Tires.

Size	Used Tires	Used Tubes	Size	Used Tires	Used Tubes
30x3.....	\$ 4.00	\$1.25	35x4.....	\$ 8.00	\$1.75
30x3 1/2.....	4.75	1.45	36x4.....	8.00	1.75
31x3 1/2.....	5.00	1.50	34x4 1/2.....	8.50	1.75
32x3 1/2.....	5.75	1.50	35x4 1/2.....	8.50	1.80
34x3 1/2.....	6.00	1.60	36x4 1/2.....	8.75	1.85
31x4.....	6.75	1.65	37x4 1/2.....	10.00	1.90
32x4.....	7.50	1.60	36x5.....	9.00	2.00
33x4.....	7.75	1.70	36x5.....	10.00	2.00
34x4.....	8.25	1.70	37x5.....	10.25	2.20

All goods shipped O. O. D. subject to examination, on receipt of 10 per cent of order.

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30x3 1/2....	7.86	8.82	35x4 1/2....	18.72
32x3 1/2....	9.09	10.17	36x4 1/2....	18.93
32x4.....	12.33	13.83	37x5.....	23.45
33x4.....	12.90	14.46		

Send 10% with order, balance C. O. D. subject to inspection.

THE OHIO

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We can save you money on all  
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Write for Special Prices.

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These tires were originally guaranteed for 7500 miles—all firsts—15% deposit on all C. O. D. orders.

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30 x 8 1/2.....	\$6.00	34 x 4.....	\$8.00
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E Eisemann (High Tension), \$20.00 to \$45.00.  
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I PARTS FOR ALL MAGNETOS  
A ALWAYS IN STOCK.  
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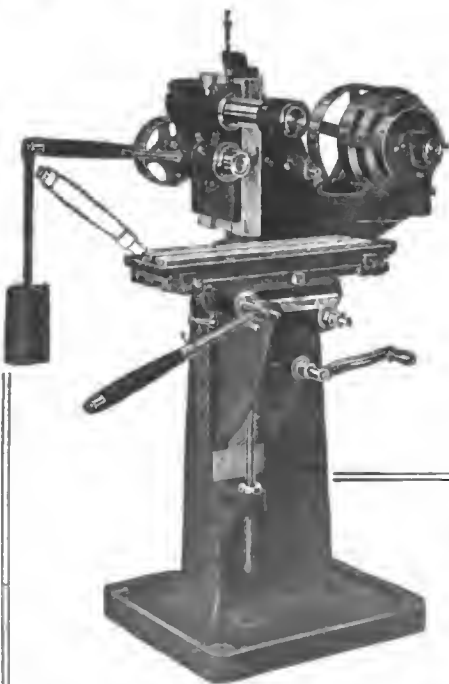
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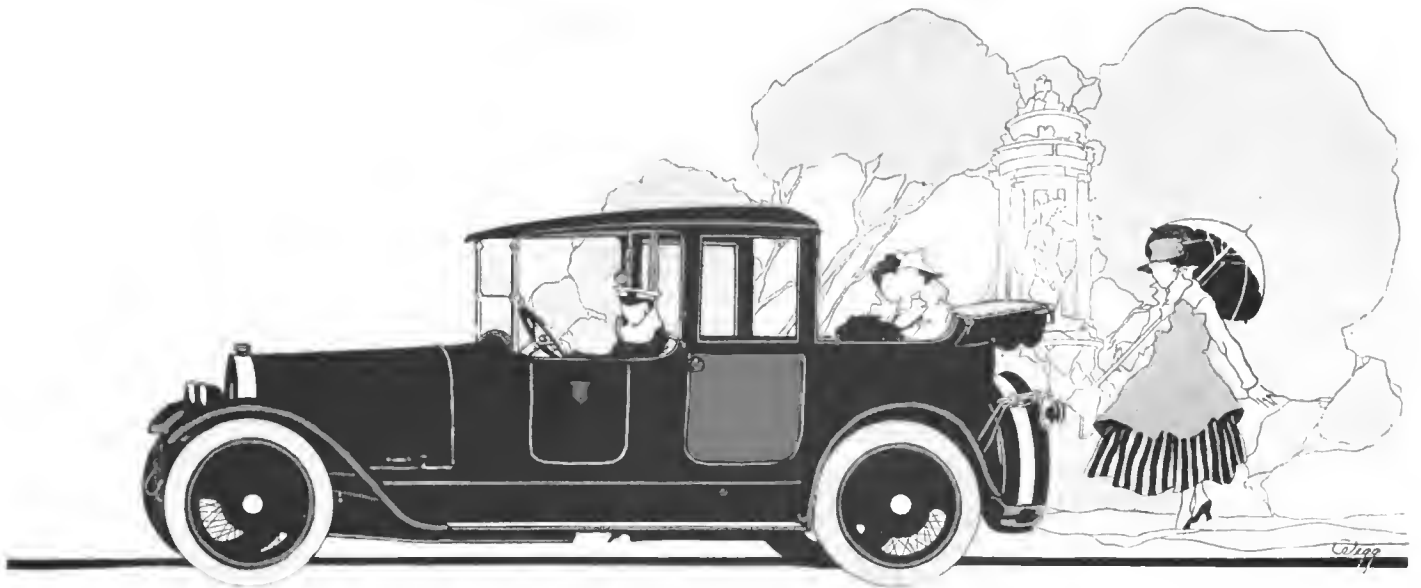
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# The AUTOMOBILE

Vol. XXXVI  
No. 8

NEW YORK, FEBRUARY 22, 1917

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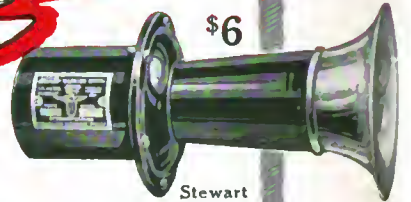
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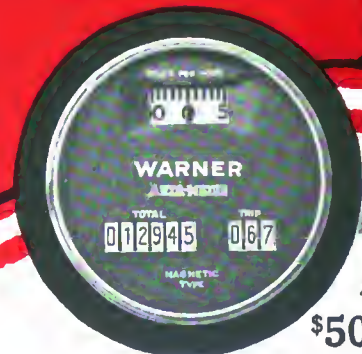
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\$12

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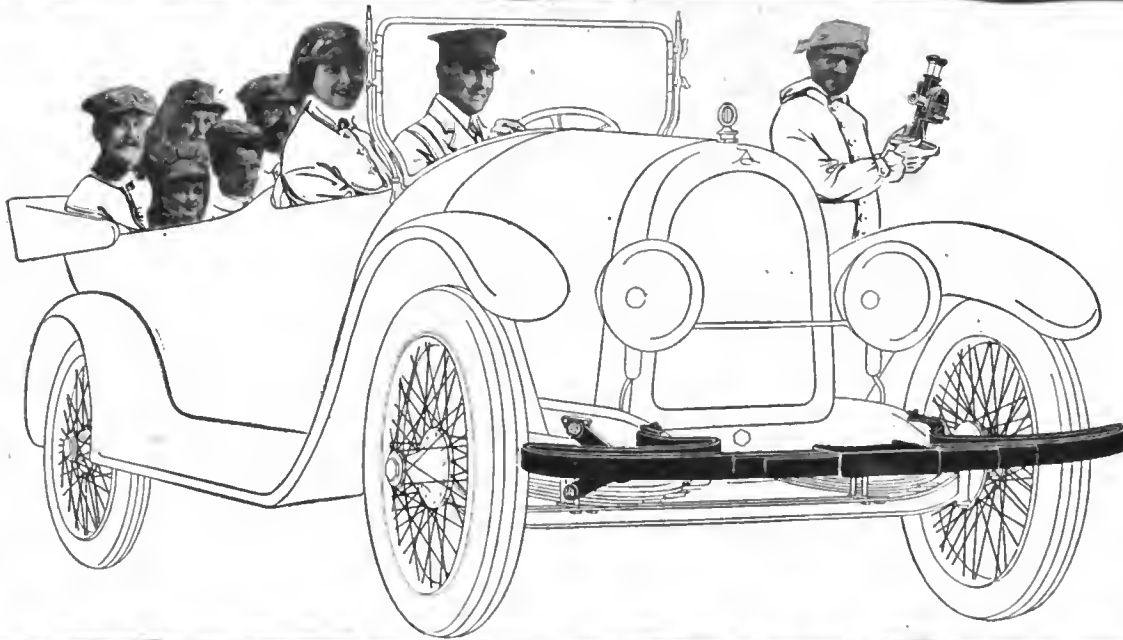


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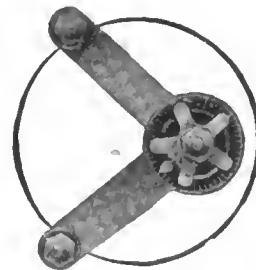


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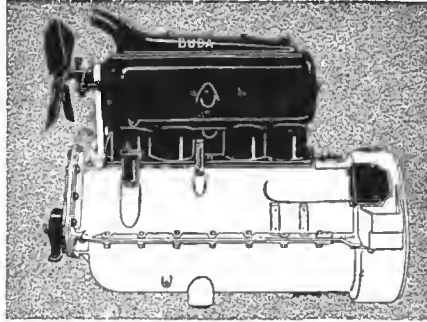
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**The AUTOMOBILE**  
 THE CLASS JOURNAL COMPANY  
 231-241 W. 39th STREET NEW YORK CITY  
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# The AUTOMOBILE

## Stutz Earns \$8.65 Per Share

Net Profits \$649,042—Sales in 7 Months Total \$1,771,328—1535 Cars Sold

INDIANAPOLIS, Feb. 16—Net profits of \$649,042 for the year ended Dec. 31, 1916, are reported by the Stutz Motor Co., this city. These are equal to \$8.65 per share on the 75,000 shares of stock, no par value of the parent company, the Stutz Motor Car Co. of America, which took over the local company in June last, owning all of its capital stock.

The income account for the 7 months ended Dec. 31, shows net profits for the period of \$381,061, equivalent to \$5.08 per share. During that period \$1,771,328 in cars were sold. During the whole year the company produced 1535 cars, an increase of 42 per cent over 1915.

Within the past year the company has completed its new building, so that it now owns and occupies the entire square block from 10th Street and Capital Avenue. In addition to its new building the company has leased another building wherein it has installed new machinery at a cost of about \$75,000 for the manufacture of its new 16-valve motors.

The entire expected maximum output of cars for 1917 has been contracted for.

The income account for the 7 months ended December appears at the right.

### Hal Offers Four Standard Colors

CLEVELAND, Feb. 17—The Hal Motor Car Co., this city, has offered four colors as standard finish to its models this season. Any one of the six styles of bodies mounted on the Hal twelve chassis can be purchased finished in a gun-metal gray, a maroon, a thistle green or a special Hal blue. Further, to give the purchaser an opportunity of expressing his own personality, an option is given

by the manufacturers of having the wood wheels of the car painted any color the buyer wishes and the body striped in any one of several colors that harmonize with the color of the car in question.

### Utz Standard Parts Chief Engineer

CLEVELAND, Feb. 19—J. G. Utz has been appointed chief engineer of the Standard Parts Corp. Mr. Utz was with the Perfection Spring Co. for 5 years. E. W. Dunston has been appointed chief engineer of the spring division and R. A. Townsend has become chief metallurgist in charge of the laboratories of the spring division.

The corporation will open executive offices soon in the heart of the Cleveland business district.

### Willys-Morrow Co. Incorporated

TOLEDO, Feb. 20—The Willys-Morrow Co., this city, has been incorporated for \$100,000 under the Ohio laws to manufacture automobile parts and to take over the Morrow Mfg. Co. John N. Willys is making this move to have all the subsidiary companies under the same laws as the parent company. The Morrow Mfg. Co. was a New York corporation.

### STUTZ INCOME FOR 7 MONTHS

Net sales .....	\$1,771,328
Cost of sales.....	1,374,066
Gross profit on sales.....	\$397,261
Selling and general expenses.....	44,747
	\$352,513
Interest and discount earned.....	28,547
Profit for seven months.....	\$381,061

The output and net profits for the past 4 years compare as follows:

Year	Output	Net Profits
1916 .....	1535	\$649,042
1915 .....	1079	866,475
1914 .....	649	151,106
1913 .....	759	292,080

The condensed balance sheet follows:

Assets		Liabilities	
Fixed assets	\$331,603	Payables....	\$356,980
Goodwill ...	2,100,000	Deposits on	
Cash .....	74,060	cars .....	17,700
Receivables...	145,530	Taxes .....	8,500
Inventory...	577,248	Reserves....	31,289
		Surplus.....	2,439,022
Total .....	\$3,228,441	Stock at \$5.	375,000
		Total .....	\$3,228,441

## Quantity Production for Redden

\$4,000,000 Company To Have 20 Assembly Plants—To Make All Parts

NEW YORK, Feb. 17—Quantity production, backed by a \$4,000,000 capital, is the basis of the big merchandising plan of the Redden Truck Co., which has just completed its organization for the manufacture of the Redden-Truck-Maker.

Twenty branch assembly plants in twenty of the largest cities in the country are part of the manufacturing and merchandising plan of the company. The main factory of the enterprise will be located either at Joliet, Ill., Jackson, Mich., or Chicago, where the people interested already have large manufacturing interests. Subsidiary plants will be installed and operated after the Ford plan.

Prominent in the organization of the Redden company are the following: Horace DeLisser of the Ajax Rubber Co.; H. W. Cowan, capitalist and former associate of F. W. Woolworth; C. A. Bickett, president of the Chicago Bearing Metal Co.; L. B. Patterson, Chicago banker; and W. K. Pritchitt, of the New York banking house, Pritchitt & Co.

A coterie of Chicago and local banking and manufacturing interests have arranged to re-finance the company and place it in a position to manufacture the attachments complete in plants that will be allied with the Redden company. This will enable the company to make the job complete from the rolling of the channel steel for the frame to the building of its own tires.

### Graham Joins Pierce-Arrow

BUFFALO, Feb. 20—G. M. Graham has been appointed assistant commercial manager of the Pierce-Arrow Motor Car Co., this city. Mr. Graham was formerly with the Willys-Overland Co.



## Ford Tractor Co. In Canada

**\$10,000,000 Concern to Take Over Interests There of Ford Tractor Co., Inc.**

FORD CITY, Feb. 19—The Ford Motor Tractor Co. of Canada, capitalized at \$10,000,000, has been incorporated and will have its head offices in Canada. It will build, construct, operate and prepare for the market, motor tractor engines, machinery and equipment in connection with the manufacture and operation of tractors and will take over the business in Canada of the Ford Tractor Co., Inc., including patent rights within the Dominion for the Ford tractor.

The company will erect a plant in this city on a 50-acre site early this spring.

### Ford to Give Up L. I. Plant

NEWARK, N. J., Feb. 20—The Ford Motor Co. will give up the Long Island City plant in about 1 year as soon as the buildings at Kearny, N. J., are completed. The company is now building docks at Kearny and will erect the buildings later. The company has 80 acres of land and the structure will be four stories. The export business will be handled there.

### Ford Agents Replace Defective Parts

DETROIT, Feb. 19—Ford agents are receiving advice from the Ford Motor Co. saying that they may now make repairs and replace defective parts to cars if in the judgment of the agents such parts are defective, or if these defects are within 90 days after the date of the sale of a car. After this time has elapsed, they must be sent to Detroit.

In the past if the purchaser wanted a defective part replaced, it had first to be sent to Detroit or to the nearest branch for inspection.

### Cupples Adds Tire Manufacture

ST. LOUIS, Feb. 16—The Cupples Co., this city, will increase its rubber department for the manufacture of a new type of automobile tires and inner tubes.

### Gamble Partner in Advertising Firm

CLEVELAND, Feb. 16—T. S. Gamble has come a partner in the firm of Benson, Campbell & Slaten, with offices in this city and Chicago. He was formerly with the Maxwell Motor Sales Corp.

### Warner Gear To Build

INDIANAPOLIS, Feb. 20—The Warner Gear Co., Muncie, will begin the construction of new buildings and the installation of equipment that will double

the capacity of the plant. The company's capital stock has been increased from \$500,000 to \$1,500,000. The number of employees will be increased from 1000 to 2000 when the improvements are completed.

### Frost Gear Elects Officers

JACKSON, MICH., Feb. 19—Officers and directors for the ensuing year were elected by the Frost Gear Co. at the annual meeting held Tuesday. The officers are as follows: President, E. E. Frost; vice-president, M. C. Townley; secretary, Robert Smith; treasurer, A. S. Glasgow. The board of directors includes the officers and Thomas Woodfield, E. J. Weeks and James Heaslet, the latter of Detroit. Mr. Heaslet also holds the office of vice-president in the company.

### Canadian S K F Co., Ltd., Formed

TORONTO, ONT., Feb. 17—The Canadian S K F Co., Ltd., has been organized and will manufacture and sell S K F bearings in the Dominion of Canada. Headquarters have been established at 47 King Street, West.

## Akron Rubber Production \$188,000,000

**Twenty-seven Companies Averaged 40,000 Tires Daily in 1916**  
—Rubber May Replace Leather

CLEVELAND, Feb. 17—Last year the twenty-seven rubber companies of Akron manufactured rubber products valued at \$188,000,000, according to Dr. W. C. Geer, director of processes of the B. F. Goodrich Rubber Co., in an address before the Cleveland Engineering Society here to-day. He said the output of these rubber concerns was 40,000 tires daily. Dr. Geer predicted that within 2 years the rubber business would replace a large part of the leather business, and that shoes now made of leather would be made of rubber.

### Jay Joins Engineering Firm

NEW YORK, Feb. 17—John C. Jay, Jr., has joined the firm of Jamieson, Houston & Graham, consulting engineers. Hereafter the firm will be known as Jamieson, Houston, Graham & Jay. Mr. Jay was formerly chairman of the board of directors of the Maxwell Motor Co. and vice-president of the Pennsylvania Steel Co.

### Brown an Elgin Director

INDIANAPOLIS, Feb. 20—W. H. Brown, of this city, formerly vice-president and assistant general manager of the Willys-Overland Co., has been made director of sales of the Elgin Motor Car Corp., Chicago.

## Purchaser and Seller Financed

**Commonwealth Finance Corp. to Aid Sale of Cars and Trucks by Time Payments**

NEW YORK, Feb. 19—The financing of the purchase of commercial vehicles and passenger cars upon the time-payment plan is included in the scope of the Commonwealth Finance Corp., incorporated under the laws of South Dakota with a capital of \$10,000,000 7 per cent cumulative preferred and \$7,500,000 common. The fiscal agent is Sargent & Co., Minneapolis. An office will be opened in the Trinity Building, this city.

According to the plans of the company, it will purchase from responsible dealers deferred-payment paper on cars which they have sold. Such paper, carrying the endorsement of the dealers together with that of the company, can readily be resold at a profit.

Purchasers of automobiles will also be financed, the security being a mortgage upon the car itself or a contract whereby the title to the car remains in the name of the Commonwealth corporation until the last payment is made, together with an insurance policy covering fire and theft. The margin of security will be ample, as the company purposes to accept deals only on terms where the amount outstanding on deferred payments is fully covered by the forced-sale value of the car.

### 780 Members in Detroit S. A. E. Section

DETROIT, Feb. 16—The membership committee of the Detroit section of the Society of Automobile Engineers held a meeting last week, at which Chairman W. C. Keys reported that the section has increased its membership by more than 100 members within the past 3 weeks and now numbers a total of 780. It is now expected that the section will have 1000 members by April 1.

### Salesmanship Congress in Detroit

DETROIT, Feb. 17—The 1917 annual session of the World's Salesmanship Congress will be held in Detroit. The date has not yet been definitely decided.

### \$2,000,000 Order for Denneen Truck

CLEVELAND, Feb. 17—The Denneen Motor Co., this city, has just received from the Commercial Vehicle Motors Co., Chicago, shipping orders for \$2,000,000 worth of motor trucks. The order calls for 2000 trucks of a new model, the details of which will be announced later.

## No Racing Cars from Europe

Speed Creations Taken Over by Governments—Fiats May Reach U. S.

PARIS, Feb. 10.—There appears to be an impression in America that Europe can still provide a few racing cars. The fact is that all the European factories have been swept clean of all their speed creations and have had no opportunities of making new ones since the outbreak of war. In August, 1914, successful racing cars were to be found in the Peugeot, Delage, Sunbeam, Mercedes, Fiat, Opel, and Nagant factories. Vauxhall had a set of cars which might have become successful if six months' more work had been put into them. All the Peugeots have been shipped to America, and the Peugeot factory is incapable of producing any more machines for its race team has been broken up, its race engineer having formed an independent company to manufacture aviation engines, Boillot has been killed and Jules Goux is a lieutenant in the French army. Delage has also sold all his cars with the exception of Guyot's machine which finished third at Indianapolis in 1914. This has been converted into a fast runabout, for its cylinder capacity exceeds the 300-in. limit. Delage has maintained his complete organization, but is too busy on army work to produce racing machines. Sunbeam made a new engine for the 1914 Grand Prix racers and sent one to America last year, but it is understood no more have been built, except the two for Rickenbacher.

### Mercedes Has Racers

Mercedes possesses the most successful racing cars, but unless the British fleet can be put to sleep they will not reach America until after the war. It is known that several persons have tried to get the machines out of Germany, but have had to abandon the attempt. The Opel cars are less interesting, but they also are unavailable by reason of the blockade. Fiat has two of the last French Grand Prix cars, and it is likely that they will reach America in the spring in order to race for the new American Fiat Company, now controlled by the parent factory. These are the only available cars, and they are not for sale. The 300-horsepower Fiat is at the Turin factory, where it has been lying since Arthur Duray made his attempt on the world's kilometer record. The car, however, is privately owned and does not appear to be for sale. Also its dimensions put it out of competitive racing. The Nagant factory is in Belgium and only the Germans know what has become of the set of 1914 racing cars run at Lyons.

Although there are no racing machines available now, indications are that they will be produced on the declaration of peace. All the automobile factories have secured a strong financial position and have had wonderful experience on aviation engines. Engineer Henry, who was responsible for the Peugeot engines, states that since he took up aviation motor design and construction he has learned more than he ever considered it possible for a man to learn. Other firms have acquired valuable experience and will be anxious to show their worth by producing special racing creations. In a few cases drawings have been prepared, but of course no constructive work has been done.

### Fords Must Be Sold Before Shipped from Plant

DETROIT, Feb. 16—Owing to freight conditions, the Ford Motor Co. is not permitting its dealers to stock up with cars. Shipments are made only after the car has actually been sold. In this way the cars have moved exactly in accordance with sales and not in accordance with the individual estimates of the dealers on the number of cars that will be sold in a certain territory. The dealer is, of course, allowed to have a show car and a demonstrator.

## Republic To Control Torbensen

Acquisition of Stock In No Way Alters Policy or Management of Axle Co.

ALMA, MICH., Feb. 19—The Republic Motor Truck Co. is arranging a plan to obtain control of the Torbensen Axle Co. of Cleveland. The plan will allow the Tobensen company to continue the manufacture of axles for practically any concern that wants to purchase them.

As arranged, the plan calls for an increase of capital stock in the Republic company whereby 15,000 shares of new stock would be offered to stockholders at \$100 per share. The Republic company expects to secure control of all of the issued common stock of the Torbensen concern, of which there are 7500 authorized, par \$100 and 3950 outstanding. There are also 10,000 shares of \$100 par preferred, of which 5000 shares have been issued.

It is stated that this deal will give the Republic company control of the only internal gear patents in existence.

### Management Unchanged

CLEVELAND, Feb. 21—Acquisition of some of the Torbensen stock by the Republic Motor Truck Co. in no way alters the policy or management of the Torbensen Axle Co.

## Peerless and Grant Raise Prices

Former \$90 to \$100 Higher—Latter \$50 More—Effective Feb. 28 and March 1

NEW YORK, Feb. 19—The Peerless Motor Car Co., Cleveland, will raise its prices Feb. 28. On that date the touring car and roadster selling at \$1,890 will be \$1,980; the Sedan, now \$2,750, will be \$2,840, and the limousine will rise in price from \$3,260 to \$3,350. The sporting roadster and the coupé will remain at their present prices. Peerless officials state there will be no new passenger car model offered by the company this year.

The big addition to the Peerless plant will be ready for occupancy March 10. The annex to the factory comprises 150,000 sq. ft., which will be devoted exclusively to the manufacture of passenger cars. Building operations on the addition have been under way since October, 1916.

### Grant Six Price \$50 Higher

CLEVELAND, Feb. 18—The price of the Grant Six will be raised from \$825 to \$875 on March 1.

### Dayton Becomes Ajax Sales Manager—Matlack Resigns

NEW YORK, Feb. 16—F. E. Dayton has become general sales manager and a director of the Ajax Rubber Co. This promotion comes to Mr. Dayton following the retirement of J. C. Matlack, whose resignation was accepted last week at the annual meeting of the company.

Mr. Dayton has been associated with the Ajax company for 4 years and has been assistant in charge of the tire sales. Previously he was sales manager of the Columbia Motor Car Co., Hartford, and branch manager in Boston and Chicago for the Electric Vehicle Co.

Mr. Matlack, who was secretary and general manager, has been a prominent figure in the tire industry for the past 15 years and has been connected with the Ajax company for the past 8 years. He entered the tire business as president of the International Automobile & Vehicle Tire Co., Middletown, N. J., succeeding Harrison Williams. When that company was sold to the Michelin Tire Co., he became vice-president and general manager. He left this company in 1909 to join the Ajax company as general manager.

He will take a few months' rest, after which, it is expected he will announce his plans for the future.

## Automobile Industry Will Lead in National Defense Preparations

Should War Come, Its Plants Will Be Prepared To Play Important Part in Production of Munitions—Coffin Will Direct Munitions and Automobile Plants

WASHINGTON, Feb. 20—The automobile industry as an industry will undoubtedly be called upon to play a most important part in an industrial way in the work of preparing for the national defense should this country become involved in war with any foreign country. And, in addition to this, this industry is to be called upon to get ready to do its bit in an effective way by turning, in the very near future, to the manufacture in small quantities of certain articles of defense, according to Howard E. Coffin, chairman of the Council of National Defense.

Mr. Coffin stated, in an interview granted the representative of THE AUTOMOBILE, that the automobile industry would be called upon to build aeroplanes, motor boats, motor vehicles of various kinds, tractors, armored cars, trucks, some passenger cars of the kind needed for the quick transportation of officers and men, and motors, alone. Automobile plants, however, would not be restricted to the kind of manufactures to which they ordinarily give attention as many of them, those found to be best suited for the purposes, would be turned to the manufacture of metal work such as shells, arms, etc. On the theory that education in time of peace constitutes one of the essentials of practical preparedness, Mr. Coffin said, attention is to be given to the placing of small orders with such plants that they may begin to assemble the machinery necessary, and instruct their workmen in the making of these articles, so that in case of an emergency the managements can turn quickly and effectively to such tasks on a big scale.

### Educating Producing Resources

The question of the education of producing resources has been given close attention by Mr. Coffin and those engaged with him in the Council of National Defense. It has been agreed among members of the Council that a policy involving small, educational orders is the one to pursue at this time, and this policy has been finally adopted. Mr. Coffin has been placed in charge of a committee which will have to do with manufacturing establishments and munitions plants.

Mr. Coffin is now giving his close attention to the practical carrying out of this plan for the introduction of the craftsmanship of the munition maker into manufacturing establishments which have never previously made munitions.

This preliminary work will precede all other steps along this line. As a result, the factory which is now engaged in the making of automobiles will not be called upon to make a departure sufficiently radical to interfere with its usual operations, but it will be urged to turn attention to a limited extent to small government orders of a particular kind for which it will be paid the prevailing prices for such manufactures.

So numerous have the automobile factories of the country become, and so extensively are they operating, that, while some might, should war come, be continued as manufacturers of automobiles of various types, alone, a very large proportion of them would doubtless be called upon to convert their plants into the making of munitions or parts of munitions.

### Accessory Makers' Part

Naturally, according to Mr. Coffin, the accessory manufacturers would be most apt to be relied upon for the making of fuses and other small munitions parts. The lack of plants equal to the task of turning out aeroplanes in any considerable numbers to-day would mean almost certainly that this work would fall upon the automobile manufacturers. The same would be true as to motor boats.

This being true, the time required to change the automobile establishments over from a peace to a war footing would depend upon the extent to which they had given attention to the education of their employees along the lines suggested to them by Mr. Coffin and his aides. Mr. Coffin made it plain in his talk that manufacturers would not be called upon to do an unreasonable lot of work for the Federal Government in turning out the articles for which orders would be given them, but only enough to result in training a sufficient number of men along specific lines of manufacture to form the nucleus for a larger force to work under the direction of these craftsmen.

Mr. Coffin presided over a meeting of defense societies representing all sections of the country at a meeting held on a call issued by him. The object of this meeting, as explained in the call, was to form a national organization which would work in harmony with the smaller and more compact body, the Council of National Defense, and to aid the members of the latter organization in carrying out plans for mobilizing the industries of the coun-

try, on which they have been working for months.

National headquarters will be established in Washington by this new body, and it will be composed of representatives of at least forty societies. To a limited extent the information gleaned by the Council of National Defense as to what may be expected from the industries of the United States based on the survey of the same recently completed, will be imparted to the new national body. This survey covered 27,000 establishments to which questionnaires were sent out and there is now safe in the vaults in the war and navy departments detailed and technical information as to what might be expected from each of these 27,000 establishments in the way of the manufacture of arms, munitions, and equipment.

### Automobile Industry Leads

The Council of National Defense now in session in Washington has decided that the automobile industry of the country will be placed in the first line of industrial defense in the event of war between this country and Germany, which, day by day, grows more imminent, and Howard E. Coffin of Detroit, president of the Hudson Motor Co., will be in charge of the operation of that industrial section of which the automobile industry will be a part. So critical is the outlook regarded announcement has been made that from now on Mr. Coffin will not leave Washington for any length of time except on defense matters until there is a change in the international situation.

Mr. Coffin has been placed in charge of munitions plants, as well as automobile and other strictly manufacturing establishments. At this writing the Council had not reached the point of deciding upon the specific uses to which the automobile and other manufacturing establishments will be put, as Mr. Coffin will be relied upon to work out these details, his intimate knowledge of the manufacturing business equipping him in an exceptional way for such a task.

W. F. Gifford, director of the Council, states that it has not yet been possible to so classify the information already collected that a knowledge might be gained of the extent to which the industries could be relied upon in an emergency, but that such classification will have been completed shortly. Due to the facilities of the automobile establishments of the United States, and based upon expressions by high officers in a position to know, it may be relied upon that this industry will be early called upon to do a big share of work necessary to an adequate national defense.

Further, it is understood, the information in the hands of the Council, gained through a most systematic survey of the industries of the country, is such as

satisfy the members that the automobile industry is already in a most gratifying condition as far as prompt and effective co-operation in work along industrial lines is concerned. It has been stated in connection with the meeting of the Council that events transpiring during the war in Europe have demonstrated so forcibly the important place which the motor industry occupies in its relation to the needs of modern warfare that the entire resources of such in this country are certain to be drawn upon.

Mr. Coffin's first work in charge of manufactures and munitions will be in connection with the standardization of industrial processes so that the conversion from peaceful to wartime activities can be accomplished in the shortest possible time and with the least loss of energy. This work is almost certain to be first directed to that branch of industry with which he is most familiar, the automobile, and then in proportion to their magnitude and manufacturing importance, the others.

#### Appointments Made

President Daniel Willard of the Baltimore & Ohio has been placed in charge of transportation and communication by the National Council, and he has arranged to make the American Railway Assn. the instrument for handling all transportation of men and supplies. Dr. W. H. Martin of Chicago, a member of the Council, will handle all problems of general sanitation, and direct the medical work. Dr. Hollis Godfrey of Drexel Institute, Philadelphia, will be in charge of scientific work, including engineering and educational problems, and research.

Bernard Baruch of New York will be in charge of the rounding up of raw materials, minerals and metals. E. S. Stettinus of Morgan & Co., New York, who has handled details of all purchases in this country for the entente allies, appeared before the Council this week and discussed the most effective manner of mobilizing supplies.

#### Overland Offers Plant to U. S.

TOLEDO, Feb. 17—John N. Willys has telegraphed President Wilson that the Willys-Overland plant is at the service of the United States Government. Nearly all the big automobile companies have offered similar services since the severing of diplomatic relations with Germany.

#### Goodrich Adds 38 New Stores

AKRON, Feb. 18—Thirty-eight new stores will be opened by the B. F. Goodrich Co. March 1. These will serve as distributing points for dealers in their territories. The managers have been taking an educational course at the Akron factory under the personal direction of A. Kobler.

## Dealers May Be Without Cars

### Shipments from the West Are Weeks Behindhand—Makers Plan Relief Methods

NEW YORK, Feb. 19—"Thirty days of sunshine will mean that New York will be without any new automobiles." Such is the present prospect in the Eastern market, in the opinion of one of the largest metropolitan agencies. In an extreme form this expresses the fact that shipments to New York are irregular, behind time from 3 days to 5 weeks, and coming in smaller quantities than the local buyers demand.

Several companies are taking special methods to relieve the freight shortage situation. Willys-Overland gets one trainload of cars from New York weekly, and has to unload the train immediately and return it. The company can make no individual shipments. Studebaker is using the greater part of its traffic force in the actual physical work of spotting empty freight cars and getting them loaded. The company also has a follow-up system which keeps track of each car and sees to it that the dealer unloads quickly.

There are no freight shipments at all out of Pontiac, Mich., which means that the Oakland cars are all coming east by express and are going to nearby points under their own power. Buick and many other companies report that when the spring rush comes the chief way that New Yorkers will be able to get cars, will be to have the automobiles driven out from New York under their own power.

The headquarters of the trouble is at Detroit. At one time there were 25,000 loaded cars in the city awaiting shipment. Once they get started it is hard to get past Buffalo. "An order that would usually get to us in 7 days from the factories, now takes from 3 to 4 weeks," this expression of opinion from one of the Broadway dealers, is characteristic of the testimony all along the row.

#### \$10,000,000 in Cars Delayed

More than \$10,000,000 worth of automobiles are tied up in Detroit because of existing freight conditions produced by embargoes declared by thirty railroads since the beginning of the U-boat war. These figures are based on a statement made by J. S. Marvin, general traffic manager of the National Automobile Chamber of Commerce, who states that "unless something improves matters radically in the next few weeks, the situation will become even more serious. Mr. Marvin found that there are more than

25,000 empty freight cars tied up in Chicago."

All of the factories are driving cars to the different dealers and every train carries distributors and drivers to Detroit who come to drive cars back to their cities.

The Packard company has approximately \$1,000,000 worth of cars tied up and is driving its products to Toledo, Cleveland and Columbus. The Ford Motor Co., which requires at least fifty empties daily, is now securing from six to ten each day. Dodge Bros. are sending cars under the "drive-away" rule and are thus shipping an average of 150 per day. The Cadillac Motor Car Co. has 1000 cars ordered, paid for and ready for shipment which it has been forced to place in storage because of lack of shipping facilities. The Paige-Detroit company is in the same position.

The Calmors company has 300 cars in storage and is threatened with a shortage of material. More than 400 cars lay idle at the Hupp Motor Co. plant with little prospect of early shipment, and the company has been paying express charges of \$250 per day in order to secure materials from Cleveland alone.

Maxwell, Hudson, King and other big concerns are experiencing the same conditions and all are busy fitting their products for those drivers from the different agencies who come to navigate the cars over the roads to their home towns. And many companies are driving their cars to nearby cities where they hope to secure better shipping facilities.

#### Falls Sends Engines by Express

SHEBOYGAN FALLS, Wis., Feb. 19—The Falls Motors Corp., Sheboygan Falls, Wis., is forwarding engines to its customers beyond Chicago in carload lots by express because of the demoralized freight traffic situation throughout the country. One of the largest users of Falls motors is the Grant Motor Car Corp., Cleveland, and several express cars are loaded each week to keep the big factory supplied with motive units while the freight tangle continues.

#### Haynes Driving Cars Overland

INDIANAPOLIS, Feb. 20—The Haynes Automobile Co., Kokomo, is avoiding inconvenience and a business tie-up from freight embargoes by driving cars overland under their own power. Twenty-six touring cars were shipped to Detroit, Mich., in this manner last Tuesday, and twenty-five cars left for the same destination last Friday night. Since the freight embargo delayed shipments the company has shipped cars under their own power as far east as Johnson City, N. Y., a distance of 790 miles. Cars are to be sent to dealers in the same manner in Cleveland, and Cincinnati, Ohio.

## Wyandotte Business Doubles

### Detroit Truck Company Shows Surplus of \$80,438—Officers Re-elected

DETROIT, Feb. 19—The Detroit-Wyandotte Motor Truck Co. held its annual meeting last week and showed that the volume of business handled by the company in 1916 was approximately double that of the year preceding. The financial statement shows net surplus of \$80,438.99 at the end of the year. Directors were elected as follows: G. A. Horner, M. O. Crawford, F. H. Hester, D. Rasch, J. J. Marx.

The directors re-elected the following officers: President and general manager, G. A. Horner; vice-president, D. Rasch; secretary and treasurer, M. O. Crawford.

#### Clark Carriage To Build Bodies

OSHKOSH, WIS., Feb. 19—The Clark Carriage Co., Oshkosh, Wis., for many years a leading manufacturer of fine horse-drawn vehicles, is effecting a re-organization and will engage in a large production of all kinds of bodies for motor vehicles. H. M. Clark will remain as president, and the factory management will continue to be in charge of H. M. Foulke.

#### Kent Offices in Belleville

NEW YORK, Feb. 16—Kent Motors Corp. of 1790 Broadway will move all their executive offices and allied departments to their factory at Belleville, N. J., on March 31. All business will be handled for the New Jersey headquarters after that date.

NEW YORK, Feb. 16—The Kent Motors Corp., Belleville, N. J., has filed plans for a new building, 50 by 200 ft., to be erected at its plant, now in course of construction.

#### Batavia Rubber Co. Re-Elects Directors and Officers

BATAVIA, N. Y., Feb. 16—The Batavia Rubber Co. has re-elected the following board of directors: G. W. Hodges and W. T. Remick, of New York; W. R. Smith, W. P. Berrien and C. M. Marvin, of this city.

The following officers were re-elected: Chairman of the board, G. W. Hodges; president, W. R. Smith; vice-president, W. P. Berrien; treasurer, C. M. Marvin; assistant treasurer, W. S. Whitman, of Batavia.

The stockholders will hold a special meeting on Feb. 23, at which time they will vote on a proposition to increase

their capital stock from \$500,000 to \$750,000.

The company has purchased about 2½ acres of land adjoining the present factory. If certain arrangements can be made, the company proposes to bring the Simplex Rubber Co. of America, Ossining, to Batavia. The latter company manufactures solid rubber truck tires and a large line of mechanical rubber goods.

#### Merger Probable

Negotiations were started last year with a view of taking over the Simplex company, and during the past 2 weeks the local company has gained the consent of practically all of the stockholders, and in all probability the plant will be moved here.

#### Disbrow Motors Officials Appointed

CLEVELAND, Feb. 19—W. D. Callinan has been made first vice-president of the Disbrow Motors Co. of this city, of which Louis Disbrow is president. Edward P. Strong is second vice-president and Morris Becker becomes secretary and treasurer.

#### Apperson Plant Completed

INDIANAPOLIS, Feb. 20—The Apperson Bros. Automobile Co., Kokomo, has completed the construction of its new factory, new equipment has been installed, and an entire new plant now is in operation. The old buildings will be utilized, but practically all of the manufacturing will be done in the buildings of the new group. The new plant, pronounced by engineers as one of the most complete and perfect in the industry, was planned and built under the supervision of Elmer Apperson, president and general manager of the company.

#### Ton-A-Ford in Plant

RACINE, WIS., Feb. 19—The Ton-A-Ford Truck Co., Racine, Wis., organized recently by George Beardsley, Chicago, and H. J. Sanders, Racine, to engage in the manufacture of light motor trucks embodying the Ford chassis, is now located in its new plant, which comprises the buildings formerly occupied by the Perfex Radiator Co., Racine. The daily capacity will be twenty-five to thirty units. The Ton-A-Ford extension chassis retails at \$345.

#### Time Payments in Chicago

NEW YORK, Feb. 20—The Guaranty Securities Corp., this city, will on March 1 assume operating control of its plan of automobile time payments, in the Middle West and Rocky Mountain territory. The Guaranty Banking Corp., Chicago, will act as correspondent for the Guaranty Securities Corp., in the operation of this plan. Offices will be maintained in the Continental and Commercial Bank Building.

## Packard Sales Race Starts

### 111 Dealers Begin Sales Race Lasting Until 2500 Cars Are Sold

DETROIT, Feb. 20—At 11 a. m. this morning 111 Packard dealers and their employees opened sealed orders telling them of a selling sweepstakes race starting Washington's Birthday at noon. The dealers have been divided into four classes and each class runs an independent race which will last until 2500 cars are sold. The 2500 cars have been divided into allotments graduated in size depending upon the number of cars sold so far this selling season. The selling season for the Packard company starts in August, and hence the number is based on past records from August to date.

When the race closes the dealer in each class who has sold the highest percentage of his allotment wins and will receive a prize. Of the dealers, 110 are in the United States and one in Honolulu. The score is to be kept on boards carrying a map of the Lincoln Highway. The distance across the continent is divided into 100 spaces, each space representing 1 per cent of quota. The racers start at San Francisco and when they have reached New York, 100 per cent of quota has been sold. For those who exceed 100 per cent quota imaginary vessels will bear them out to sea on the score board.

The race involves more than 800 salesmen and its purpose is a test of the Packard sales organization and to measure its efficiency in merchandising. Exercises will be held at the Packard factory on Washington's Birthday and President McAuley will start the race by pushing a button.

#### Collier Motor Truck Co. Formed

SANDUSKY, OHIO, Feb. 19—The Collier Motor Truck Co., capitalized at \$150,000, has been organized in this city to open a factory here with 100 men.

#### New Plant for Winther Truck

KENOSHA, WIS., Feb. 19—Ground will be broken shortly after April 1 for the first unit of the new plant of the Winther Motor Truck Co., this city. Plans are now being completed for the first shop building, to be 110 by 400 ft. in size, one-story, of fireproof construction, with sawtooth roof.

#### Winslow Resigns from Hupp

DETROIT, Feb. 19—P. E. Winslow, who for the past 3 years has been in the executive department of the Hupp Motor Car Corp., has resigned his position.

# Ajax-Racine Profits \$1,268,311

Equal to \$9 Per Share—Total  
Assets Are \$8,629,061—  
Six New Directors

NEW YORK, Feb. 16—The number of directors of the Ajax Rubber Co. has been increased from nine to fifteen. The new directorate is the representation of the Racine Rubber Co., which was recently taken over by the Ajax company. Net profits of the Ajax and Racine companies, for the year ended Dec. 31, aggregated \$1,268,311, equal to \$9 per share of the outstanding stock.

W. J. Jackson, R. W. Patterson and H. K. Prichitt were re-elected directors

for a term of 3 years. H. L. McClaren, president of the Racine company, and L. T. Vance, vice-president of the Racine company, were elected vice-presidents of the Ajax Rubber Co. The following were chosen as directors: L. B. Patterson, of Chicago; H. L. McClaren, L. T. Vance, H. C. Severance, Stuart Webster and Joseph Weissenbach, of Chicago.

### McQuay-Norris Makes Appointments

ST. LOUIS, Feb. 17—The McQuay-Norris Mfg. Co. has added the following sales representatives to its force: J. H. Bishop will travel out of the Kansas City branch office; A. F. Frost will travel out of the Dallas branch office; P. T. Egbert and G. T. Parsons will travel out of the New York branch office; J. H. Griffith, Pittsburgh office, and George Heidenreich, Cincinnati office.

# Inter-City Match In July

Reliability Run Starts July 17  
at Buffalo and Lasts  
for 3 Days

NEW YORK, Feb. 17—Dates for the proposed inter-city team reliability match were selected to-day at a meeting held in the office of the Contest Board of the American Automobile Assn., participated in by Chairman Kennerdell of the A. A. A. Contest Board, Robert Lee Morrell, head of the Metropolitan Consulate, A. A. A.; Samuel E. Hibben of Chicago, chairman of the Inter-City committee and C. G. Sinsabaugh, secretary. The dates chosen were July 17, 18 and 19 and it was decided to use Buffalo as the start and finish of the match, the Automobile Club of Buffalo having undertaken to act as host and to lay out the routes and make all hotel arrangements.

### Teams from Ten Cities

It was decided by the meeting to limit the entry to teams from ten cities, each team to consist of from five to ten cars each. So far definite assurances of support have been received from New York, Chicago, Indianapolis, Detroit and Buffalo, while Philadelphia, Boston and Cleveland are considering the matter; so it will be seen that it will be comparatively easy to fill the entry lists. Each city must declare, by May 1, its intention to compete and must announce the make-up of its team by June 1. The complete rules which will be essentially the regulations which have governed the Chicago Inter-Club team matches for the last 10 years will be framed by a committee headed by George F. Ballou, formerly of Chicago and now of New York. These will be ready by March 1 at which time entry blanks will be sent out.

Each city will be entitled to representation on the general committee which will make the appointment and hold each representative responsible for the make-up of the team in his city. At the present time these representatives are: Chicago, S. E. Hibben; New York, Robert Lee Morrell; Indianapolis, H. H. Rice; Buffalo, D. H. Lewis; Detroit, W. S. Gilbreath. In all probability Harry W. Knights will look after the Boston team, S. Boyer Davis, Philadelphia and Fred H. Caley, Cleveland.

### Hayes To Build Axles

OSHKOSH, WIS., Feb. 19—The Hayes Machine Co., Oshkosh, Wis., has developed a large department which will specialize in the manufacture of front and rear axles for motor vehicles, including trucks and tractors.

## Combined Balance Sheet Ajax Rubber Co., Inc., and Racine Rubber Co. for Period Ending Dec. 31, 1916

ASSETS		
Fixed Assets:		
Stock—Ajax of Delaware	5,000.00	
Stock—Ajax of Oregon	5,000.00	
Stock—Motor Association	100.00	
Real estate	62,279.72	
Buildings	435,032.19	
Branch furniture and fixtures	52,533.38	
Machinery at factories	570,685.48	
Machinery at branches	752.61	
Molds	228,834.07	
Patents	1,473.99	
Equipment at branches	400.00	
Tools and equipment	32,909.29	
*Organization expense	47,788.36	
		\$1,442,789.09
Current assets:		
Cash on deposit	\$395,815.03	
Advance to salesmen and branches	13,954.93	
Personal accounts	1,724.51	
Notes receivable	246,234.24	
		657,728.71
Cash deposited with Fort Dearborn Trust and Savings Bank, Chicago, Ill., to redeem balance of outstanding Preferred Stock of Racine Rubber Company, as per contract		142,107.30
Accounts receivable:		
Sales ledgers		1,626,111.09
Deferred assets:		
Unearned insurance	\$14,678.27	
Redemption of Preferred Stock	3,287.91	
Claims account	843.74	
Branch stock account	87.95	
Deferred inventory adjustment account	43,898.26	
Deposit Kansas City Water Department	5.00	
*Organization expense	21,458.49	
Employees stock contracts	8,500.00	
		92,759.62
Good will		1,842,701.08
Inventories:		
Finished goods at branches	\$392,833.34	
Finished goods at Delaware branches	186,258.87	
Finished goods at Oregon branches	102,766.73	
Finished goods at factories	529,693.83	
Crude rubber	944,141.86	
Duck sheeting, etc.	282,215.68	
Mill department material in process	34,429.61	
Tire department material in process	129,722.49	
Miscellaneous stores	222,801.91	
		2,824,864.32
		\$8,629,061.21
*To be amortised over a period of five years.		
LIABILITIES		
Current liabilities:		
Accounts payable:		
Purchase ledgers	\$271,313.37	
Ajax of Delaware	5,000.00	
Ajax of Oregon	5,000.00	
Income tax	608.01	
Stock subscriptions	117.00	
Philadelphia Branch Stock account	29.29	
Special deposit account	249,935.00	
Sundry accounts	639.14	
		\$532,641.81
Notes payable	317,000.00	
Reserve for depreciation	234,830.65	
Reserve for bonuses to dealers and others	97,625.21	
Reserve for taxes and insurance	49,680.45	
Preferred Stock Racine Rubber Company in process of redemption against which deposit with Fort Dearborn Trust and Savings Bank, Chicago, Illinois, is carried as an asset		142,107.30
Capital Stock:		
Common—142,000 shares, par value \$50 per share	7,100,000.00	
Surplus and undivided profits to Dec. 31, 1916	155,175.79	
		\$8,629,061.21

## Industrial Service by N.Y. Bank

### National City Bank Serves Customers with Financial and Factory Advice

NEW YORK, Feb. 20—The National City Bank has started a new department of industrial service, designed to render expert financial advice to customers. It is proposed to deal with practical, everyday problems of the factory, store, or office, and to supply the latest data on industrial problems obtained from all sources.

This new department will take in the study of the proper proportions between invested, or permanent, capital, and borrowed capital in connection with applications for loans. Too many firms, it is stated, are doing too much business for the capital invested with them, with the result that they are at the mercy of their banks when conditions curtail the supply of credit.

#### Rubber Men Elected Bank Officers

AKRON, Feb. 16—F. A. Seiberling, president of the Goodyear Tire & Rubber Co., was elected president of the new Ohio Savings & Trust Co. The company has just been organized by east Akron factory men whose combined payrolls amount to \$2,000,000 per month. C. W. McLaughlin, vice-president of the Mohawk Rubber Co., was elected vice-president; W. E. Palmer, assistant treasurer of the Goodyear Co., treasurer, and C. F. Ayers, secretary.

#### Bieling Heads Marmon Sales in Central States

INDIANAPOLIS, Feb. 16—W. M. Bieling has been appointed Central States sales manager of the Nordyke & Marmon Co., selling Marmon cars in Ohio, Indiana, Kentucky and adjacent territories. He will make his headquarters at Indianapolis.

H. H. Brooks has been appointed as-

sistant sales manager of the company in Indianapolis. Mr. Brooks is well known in the trade through his connection with the Marathon Motor Car Co., Nashville, Tenn.

Gerald Fitzgerald is now a member of the sales department of the Indianapolis company. Mr. Fitzgerald was formerly manager of the Minneapolis branch of the Remy Electric Co., and lately has been engaged in motor truck selling. Mr. Fitzgerald will do general traveling.

#### E. & J. Gross Income \$747,822

DETROIT, Feb. 16—The Edmunds & Jones corporation transacted for the year ending Dec. 31, 1916, gross sales amounting to \$2,829,285, from which a gross income was derived after a deduction of cost of sales of \$747,822; the general expenses were \$185,896; preferred and common dividends, \$171,625. A surplus of \$390,301 remained.

#### Copper and Rubber Lower

NEW YORK, Feb. 20—Copper and rubber prices featured last week's market activities. Electrolytic copper rose to 36½ cents a pound, while Lake copper reached 37½ cents. Rubber prices receded last week, possibly on account of the delay in the German submarine activity. Tin dropped \$5 per 100 lb. to \$49.50. Lead reached a record quotation yesterday, when it quoted at \$11 per 100 lb., a rise of \$1.50 for the week.

#### Savannah Gasoline Prices Advanced

SAVANNAH, GA., Feb. 20—The wholesale price of gasoline has been advanced from 22 cents to 23 cents, and the retail price has gone to 26 cents. Many local dealers are selling at cost, while others at an advance of 1 and 2 cents above cost.

#### Standard Tool Increases Capital

DETROIT, Feb. 17—The Standard Tool Mfg. Co. has increased its capital from \$35,000 to \$100,000.

## Federal Truck Sales \$4,261,009

### Net Profits \$680,615 Equal to 125 Per Cent on Stock—Assets Total \$1,987,723

DETROIT, Feb. 19—The Federal Motor Truck Co. in its report for the year ending Dec. 31, 1916, shows gross sales aggregating \$4,261,009.47, an increase of \$1,307,503.05 over the 1915 total of \$2,953,506.42. Net profits were \$680,615.20, equivalent to 125 per cent on the \$500,000 of outstanding capital stock, or 68 per cent on the \$1,000,000 of issued stock which the company will have after distribution of its 100 per cent stock dividend, April 2.

The balance sheet lists assets aggregating \$1,987,723.17, which compares with \$1,166,181 on Jan. 1, 1916. Quick assets total \$1,540,680.27 against \$954,845.26 at the beginning of 1916. Cash was \$121,426 against \$23,986.28, inventories \$804,164.26 against \$483,420.92 and accounts receivable \$573,496.65 against \$314,202.92.

Plant investment was \$367,457.26, comparing with \$203,156.22 a year ago and prepaid expenses amounted to \$14,937.60 compared with \$8,179.50.

Current liabilities amounted to \$493,358.99, the increase from \$228,269.44 at the end of the previous year being attributable to a larger volume of business. Bills payable were \$253,363.15 and notes payable \$200,000. At the end of 1915 bills payable were \$204,925.76. Reserve for depreciation and bad debts was \$122,263.19 increase from \$32,670.38 at the end of 1915.

Capital stock remained at \$500,000 during the year. Accumulated surplus, Dec. 31, was \$872,100.99, comparing with \$405,241.18 at the end of the year before. From the surplus at the end of 1916, \$500,000 is being transferred to capital account to compensate for the 100 per cent dividend in stock. This operation completed will leave the company surplus of about \$372,000.

#### Michigan Corporations Change Capital

LANSING, MICH., Feb. 16—The Field Motor Co., of Grand Rapids, has dissolved its \$100,000 corporation and has been incorporated for \$500,000. The Detroit Piston Ring Co. has been incorporated for \$100,000. The All-Season Body Co., Jackson, Mich., has been incorporated for \$500,000.

#### U. S. Rubber To Buy 14 Plants

NEW BRUNSWICK, N. J., Feb. 17—Fourteen subsidiary plants of the United States Rubber Co. will be taken over by the parent organization in the near future. The stockholders have

### Daily Market Reports for the Past Week

Material	Tues.	Wed.	Thurs.	Fri.	Sat.	Mon.	Week's Changes
Aluminum, lb.	.58	.58	.58	.58	.58	.58	...
Antimony, lb.	.30	.30	.30	.30	.30	.31	+.01
Bessemer Steel, ton	65.00	65.00	65.00	65.00	65.00	65.00	...
Copper, Elec., lb.	.34½	.35	.35	.36½	.36½	.36½	+.02
Copper, Lake, lb.	.34½	.35	.35	.37	.37	.37	+.02½
Cottonseed Oil, bbl.	12.70	12.65	12.50	12.40	12.40	12.38	-.32
Fish Oil, Menhaden, Brown, gal.	.74	.74	.74	.74	.74	.74	...
Gasoline, Auto, bbl.	.23	.23	.23	.23	.23	.23	...
Lard Oil, prime, gal.	1.36	1.36	1.36	1.36	1.36	1.36	...
Lead, 100 lb.	9.50	9.50	9.50	10.25	10.25	11.00	+ .50
Linseed Oil, gal.	.94	.94	.94	.94	.94	.94	...
Open-Hearth Steel, ton	65.00	65.00	65.00	65.00	65.00	65.00	...
Petroleum, bbl., Kans., crude	1.70	1.70	1.70	1.70	1.70	1.70	...
Petroleum, bbl., Pa., crude	3.05	3.05	3.05	3.05	3.05	3.05	...
Rapeseed Oil, refined, gal.	1.00	1.00	1.00	1.00	1.00	1.00	...
Rubber, Fine Up-River, Para, lb.	.85	.85	.85	.84½	.84	.83	-.02
Rubber, Ceylon, First Latex, lb.	.91	.91	.91½	.90½	.90	.89	-.02
Sulphuric Acid, 60 Baume.	1.00	1.00	1.00	1.00	1.00	1.00	...
Tin, 100 lb.	54.50	53.50	51.00	50.00	50.00	49.50	-.50
Tire Scrap, lb.	.06½	.06½	.06½	.06½	.06½	.06½	...

authorized a \$60,000,000 bond issue to secure direct control of these companies whose stock is already chiefly held by United States Rubber interests.

Col. Samuel P. Colt, president of the company, expects a business of \$125,000,000 will be done by the corporation this coming year, more than half of which will be in the footwear trade. The tire department, he says, is not showing much profit, due to severe competition in this product, and the prices are likely to increase again.

**Doble Names First Distributors**

DETROIT, Feb. 18—Announcement of the first distributors for the Doble car has been made by the General Engineering Co. The Pacific Kissel Car Co. will handle the automobile for California, Oregon, Washington, Nevada, Arizona and Hawaii. The E. C. Thompson Co. will distribute in Minnesota, the Dakotas, Montana east of the Rockies and the western half of Wisconsin.

**Woodside Studebaker Plant Supt.**

DETROIT, Feb. 19—W. P. Woodside has been appointed superintendent of plant 4, of the Studebaker Corp.

**Lumpkin Is Silvex Advertising Manager**

SOUTH BETHLEHEM, PA., Feb. 16—Walter H. Lumpkin has been placed in charge of the national advertising campaign on Bethlehem spark plugs. He was made advertising manager for the Bethlehem products at a recent meeting of the Silvex Co. He has been associated with the selling department of the company for several years.

**Motor Issues Are Stronger**

**Fisher Body Features Activities with 20-Point Gain—Tire Issues Active**

NEW YORK, Feb. 20—Strength in all of the industrial stocks was reflected in the automobile securities last week. Yesterday the issues picked up considerably despite the weakness in Bethlehem Steel, which has more or less of a potent effect on the trend of security prices.

Fisher Body preferred featured the activities last week by registering a gain of 20 points, reaching 110. Fisk Rubber common was strong and also a feature with a rise of 15 points. Maxwell issues were active as were General Motors, Chevrolet, United Motors, Saxon and Willys-Overland.

White and Continental Motors were active on account of rumors of dividend action. An increase in the White Motor dividend to a 10 per cent basis next quarter is being discussed in Wall Street. The meeting takes place early in March. Continental Motors, it is stated, will place the common stock upon a regular dividend basis about April 1.

General Motors common stockholders, it is stated, will be treated to a substantial increase in the dividend this April, because nearly all the old stock has been exchanged. The initial payment of \$1 a share last month was no indication of what the regular rate was to be when

the transition in corporate form is effected. It is probable that the coming declaration will be at least 1½ per cent and possibly 1¾ per cent. General Motors is earning a 6 per cent or 7 per cent regular rate at least five times over.

**Amazon Rubber Co. Incorporated.**

AKRON, Feb. 16—The Amazon Rubber Co. has been incorporated under the laws of Ohio for \$500,000. L. J. Schott, president of the Amazon Tire & Rubber Co., states that the new company is formed for the purpose of buying out the older concern, and will operate and enlarge the present plant.

**National Tire Incorporates for \$1,000,000**

EAST PALESTINE, OHIO, Feb. 17—The National Tire & Rubber Co. has been incorporated for \$1,000,000 to manufacture tires and tubes. Incorporators are: R. E. Waldo, H. A. Clark, H. B. Callahan, V. A. Sturgeon and H. C. Johnston.

**To Exhibit Universal Valveless Engine**

MUSKOGON, MICH., Feb. 16—One of the new valveless engines manufactured by the Universal Valveless Motor Co., of this city, will be exhibited at the Grand Rapids Automobile Show Feb. 19-24.

**Minnesota May Raise Fees**

ST. PAUL, MINN., Feb. 17—Much automobile legislation is before the Minnesota legislature at its bi-yearly session. Bills have been introduced to raise the automobile registration fee to \$5 a year,

**Automobile Securities Quotations on the New York and Detroit Exchange**

	Bid	Asked	Net Ch'ge		Bid	Asked	Net Ch'ge
*Ajax Rubber Co.	69	70	..	Springfield Body Corp., pfd.	110	120	..
*J. I. Case T. M. Co., pfd.	82	85	..	Standard Motor Construction Co.	6	7	+ ½
Chalmers Motor Co., com.	25	30	..	*Stewart-Warner Speed Corp.	84 ½	85	-1
Cbalmers Motor Co., pfd.	..	..	..	*Studebaker Corp., com.	104 ½	104 ½	+1 ½
*Chandler Motor Car Co.	96	98 ½	+ ½	*Studebaker Corp., pfd.	106	108	-1
Chevrolet Motor Co.	102	107	+7	Swinehart Tire & Rubber Co.	80	85	..
Fisher Body Corp., com.	35	40	..	United Motors Corp.	40 ½	41 ½	+2
Fisher Body Corp., pfd.	110	120	+20	*U. S. Rubber Co., com.	53 ¾	54	+1 ½
Fisk Rubber Co., com.	75	85	+15	*U. S. Rubber Co., pfd.	106	108	-1 ½
Fisk Rubber Co., 1st pfd.	101	105	..	*White Motor Co., com.	48 ½	50	+1 ½
Fisk Rubber Co., 2nd pfd.	95	102	..	*Willys-Overland Co., com.	32 ½	33 ½	+ ½
Firestone Tire & Rubber Co., com.	136	138	-4	*Willys-Overland Co., pfd.	97 ½	99 ½	+3 ½
Firestone Tire & Rubber Co., pfd.	107	107	-1				
*General Motors Co., com.	108	108 ½	+3 ½				
*General Motors Co., pfd.	88 ½	89	- ½				
*B. F. Goodrich Co., com.	56 ½	57 ½	+1 ½				
*B. F. Goodrich Co., pfd.	109	110 ½	- ½				
Goodyear Tire & Rubber Co., com.	254	258	-16				
Goodyear Tire & Rubber Co., pfd.	106 ½	107 ½	- ½				
Grant Motor Car Corp.	5	7	-1				
Hupp Motor Car Corp., com.	6	8	+2				
Hupp Motor Car Corp., pfd.	..	..	..				
International Motor Co., com.	15	17	..				
International Motor Co., 1st pfd.	..	30	..				
International Motor Co., 2nd pfd.	..	70	..				
*Kelly-Springfield Tire Co., com.	54 ½	58	+3 ½				
*Kelly-Springfield Tire Co., 1st pfd.	90	93	+2				
*Lee Rubber & Tire Corp.	20 ½	22	..				
*Maxwell Motor Co., Inc., com.	55	55 ½	+4				
*Maxwell Motor Co., Inc., 1st pfd.	68	69	+1 ½				
*Maxwell Motor Co., Inc., 2nd pfd.	34 ½	35 ½	+ ½				
Miller Rubber Co., com.	250	254	+5				
Miller Rubber Co., pfd.	105	107	- ½				
Packard Motor Car Co., com.	..	150	..				
Packard Motor Car Co., pfd.	..	102	..				
Paige-Detroit Motor Car Co.	38 ½	39 ½	+ ½				
Peerless Truck & Motor Corp.	14	18	-2				
Portage Rubber Co., com.	162	165	..				
Portage Rubber Co., pfd.	..	..	..				
Regal Motor Car Co., pfd.	27	33	..				
Reo Motor Car Co.	36 ½	37 ½	..				
*Saxon Motor Car Corp.	52	54	+5				
Springfield Body Corp., com.	70	80	..				

\*At close Feb. 19, 1917. Listed N. Y. Stock Exchange.

**OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE**

	Bid	Asked	Net Ch'ge
<b>ACTIVE STOCKS</b>			
Auto Body Co.	..	33 ½	..
Cbalmers Motor Co., com.	128	..	..
Cbalmers Motor Co., pfd.	6 ¾	6 ¾	..
Continental Motor Co., com.	9 ½	9 ¾	- ¾
Continental Motor Co., pfd.	98	..	..
Ford Motor Co. of Canada.	..	255	..
General Motors Co., com.	..	..	..
General Motors Co., pfd.	..	..	..
Maxwell Motor Co., com.	..	..	..
Maxwell Motor Co., 1st pfd.	..	..	..
Maxwell Motor Co., 2nd pfd.	..	..	..
Packard Motor Car Co., com.	..	148	..
Packard Motor Car Co., pfd.	100 ¾	101 ¾	..
Paige-Detroit Motor Car Co.	38 ¾	39	+1 ½
W. K. Prudden Co.	50 ¾	50 ¾	..
Reo Motor Car Co.	36 ¾	36 ¾	+ ¾
Studebaker Corp., com.	..	..	..
Studebaker Corp., pfd.	..	..	..
C. M. Hall Lamp Co.	..	32	..
<b>INACTIVE STOCKS</b>			
Atlas Drop Forge Co.	38	..	..
Kelsey Wheel Co.	27	33	..
Regal Motor Car Co., pfd.	..	..	..



deprive drivers convicted of intoxication while driving of license for 3 months, to make it a felony to steal a car, to make possession of automobiles with altered factory numbers prima facie evidence of theft, a tax of 25 cents per horsepower and 25 cents per 100 lb. on motor vehicles, to be in lieu of other taxes on the vehicles.

A dimmer bill has been offered prohibiting use of lights which project more than 3 feet above the surface of the road 75 ft. ahead of the car, exempting fire apparatus and publicly-owned vehicles, and providing for examination of lights by county sheriffs and a fee of 25 cents for certificate of examination.

Another bill is planned to compel all vehicles to carry lights at night. A second will permit county commissioners to compel installation of safety signals at dangerous railroad crossings, and a third to prohibit manufacture of sleighs other than those 56 in. of width at the runners.

**\$2,000 Bond for Pennsylvania Owners and Operators**

YORK, PA., Feb. 17—A bill is being prepared which will require every owner of an automobile or motor truck to file a \$2,000 bond when he applies to the State Highway Department for a license, operators and chauffeurs being required to do the same thing. The bond would be used for the benefit of any person obtaining judgment for injury caused by the automobile.

Among the revenue raising legislation being discussed is the measure for a new minimum automobile license of \$12. The present minimum is now \$5. It is estimated that the new minimum of \$12 would add to least \$750,000 to the State revenues.

Pennsylvania's receipts from automobile licenses this year have aggregated \$1,625,000, which is more than \$425,000 more than received up until this time in 1916. The total receipts during last year were \$2,325,000 in round numbers. Thus far there have been 136,500 pneumatic tire cars licensed and 10,560 solid tired machines or trucks. Last year there were 11,732 solid tired machines licensed.

**Dealers' Service Bureau in California**

SAN FRANCISCO, Feb. 17—The Motor Car Dealers' Service Bureau of California has been established and has opened offices at 1111 Post Street. The bureau will operate in practically any capacity for Pacific Coast dealers; will furnish lists of cars sold, assist in obtaining distributors and dealers, handle adjustments, claims, legal matters and collections, secure signatures to contracts, handle advertising and publicity, secure parts and close contracts, etc.

**St. Louis Factories on Peace Basis**

**Car Sales Expected to Double in 1917—Truck Sales to Gain 200 Per Cent**

St. LOUIS, Feb. 17—St. Louis factories for the past 2 years have been on a peace basis. They have not taken war orders in any large quantities and therefore do not expect any business slump when the war is over. With the prospect of uninterrupted prosperity the dealers here predict that the automobile business will gain 100 per cent in 1916 over 1917. The truck sales are expected to go up 200 per cent.

The state department is prepared to issue 150,000 licenses this year. So it would appear that others share the dealers' optimism when they place Missouri sales at 50,000 vehicles. If Missouri buys 50,000 vehicles this year, St. Louis should sell, wholesale and retail, 65,000, a new vehicles business of \$45,000,000.

St. Louis is a merchandising city. Eugene Smith, secretary of the Merchants Exchange, through which grains and other farm products are sold, is the official statistician of the city. He gives these figures for the 1915 jobbing business in several lines: Drygoods, \$75,000,000; groceries, \$65,000,000; boots and shoes, \$55,000,000; lumber, \$40,000,000; woodenware products, \$20,000,000; electric industries, \$18,000,000; soaps and candles, \$16,600,000; tobacco and cigars, \$55,000,000; hardware, \$50,000,000; automobiles, vehicles, farm implements, \$20,000,000.

Mr. Smith's figures for 1916 have not all been tabulated but he says that the increase will not be less than 30 per cent over 1915.

Bank clearings for the past 3 years were:

1914	.....	\$3,888,851,608
1915	.....	4,153,529,336
1916	.....	5,370,977,392
Jan., 1916	.....	\$429,456,675
Jan., 1917	.....	590,495,304

The prosperity of the workers in this community always is reflected in the shoe making business. Probably 60 per cent of the shoe trade here is home manufactured. Three factories showed a total increase of \$2,794,867 in business in the past year.

Beer is another prominent industry and it amounts to about \$35,000,000, out of which more than 7000 persons get a living wage. Comparatively new industries here are in heavy cast iron machinery, which is growing into a good total. The electric manufacturing business is going ahead rapidly. It was hampered for some years because two of

the largest concerns were tangled in patent litigation, which is settled and they are forging ahead.

Also the automobile equipment business is employing a constantly increasing number. This includes two new tire concerns, a number of body factories, the outgrowth of the old buggy making business, and some specialty factories. The building campaign for the year is set for heavy increases by reason of a school building campaign for which \$3,000,000 in bonds have been voted and contracts already let for office buildings.

The tonnage in 1915 was: tons received, 30,684,935; tons shipped, 22,252,181. Secretary Smith says that 1916 will show an increase of more than 15 per cent, according to figures that include railroads in all directions but not all roads.

The nearby country is largely agricultural. Last year was the most prosperous, by reason of selling prices, ever recorded. The planting of winter wheat has been 10 per cent greater. At this time the prospect is good except for moisture and it is too early to worry about that. The Illinois coal mines are working to capacity at high prices and the Missouri lumber and zinc and lead regions are enjoying excellent prosperity. The only drawback is a lack of labor.

**Truck Field Grows**

As to trucks: The dealers say that the factories are keyed up to high production because of war orders and now must find a new field. So they are going to increase the selling power in U. S. agencies. The opening of a free bridge across the Mississippi has opened a vast field. Previously the cheapest toll across the river for an automobile was 70 cents a round trip. Heavy vehicles cost more. As a result the merchants would wait until the freight cars were brought across, even when switching tonnage was charged and terminal blockades delayed shipments. Now coal and other firms are negotiating for trucks to haul much of this freight across the free bridge, built by the city. One coal firm is negotiating with a local truck dealer for a dozen of his highest priced trucks and a larger fleet of trailers.

The Allies have bought 230,000 horses through the East St. Louis horse and mule market since the war began and have paid more than \$42,000,000 for them, an average of about \$190 per animal. Thus the sale of a team provides money for an automobile, and gasoline is cheaper than hay at present prices. Anyway, feed brings more profit fed to a growing colt or calf which is sold at the end of the growing season than when fed to an adult animal. This has provided farmers with means to buy automobiles.

About St. Louis in a general way, remember that it is:

The fourth city.

That 825,000 people live in the city and 1,000,000 in the immediate trade district and 40,000,000 people within 500 miles.

That this was the only city of size that has not had a freight embargo declared against it this winter and this fact is proving attractive to many large manufacturing concerns who are establishing assembly plants and branch factories here.

That St. Louis manufacturers did not get excited over munition orders. This city did as little business along this line as any city of importance and most of the factories that did take contracts have gotten out from under and now have their employees working in other lines. The shoe dealers refused to make army shoes but are overwhelmed now with orders for civilian shoes for warring countries. The electrical concerns and a few foundries took some orders, but have completed them and have taken up other lines without loss of working force. About the only lines continued are dun stock factories and these have prepared for the future.

#### To Mobilize Women Motorists

ATLANTIC CITY, N. J., Feb. 16—American women are being prepared to care for the transportation facilities of the country in the event of war by the National League for Women's Service of New York, and by the first division, Women Motor Drivers' League, Atlantic City, N. J.

The aim of the societies is to train women so that they may take the place of men in motor bus or street car lines, or so that they may run ammunition, food, ambulance or relief cars in actual fighting territory. In case of invasion these forces would be used to carry the women and children from the invaded territory.

Mrs. I. Wolcott Thomas, 27 East Sixty-second Street, New York, is chairman of the motor division of the National League, and has started a class for women drivers at the West Side Y. W. C. A. Mrs. Mary Walker Harper, Atlantic City, is the organizer of the Women Motor Drivers' League. She hopes to put the league on a nationwide basis, and has offered its services to Governor Edge of New Jersey and President Wilson. The first division, Atlantic City, meets from time to time in the Hotel Warwick.

#### Double Seal Valve Co. Moves

NEW YORK, Feb. 19—The Double Seal Tire Valve Co. has moved from this city to 139 Beaubien Street, Detroit.

## 14,000 1916 Cars in Kentucky

### Buyers Form Bulk of Attendance at Louisville Show—Territory Prosperous

LOUISVILLE, KY., Feb. 17—Attendance at the Louisville show, held in the Jefferson County Armory during the past week, was made up of buyers rather than sightseers. There were forty-seven makes of cars displayed, of which thirty-one were gasoline passenger automobiles, three electrics and thirteen gasoline trucks. There were about a dozen accessory exhibits.

#### Business Is Better

Business in Louisville is far better than it was at this time last year. A conservative estimate based on interviews with dealers shows an increase of about 50 per cent so far this year over the same period in 1916. A few agents declare business is 75 per cent better, but this is the exception rather than the rule.

The automobile in Kentucky experienced its most prosperous year in 1916. The actual increase in registration was 12,000 for the year. The sales of new cars probably reached the total of 14,000.

Of these 14,000 new cars about 80 per cent were cars priced under \$1,000, many of them under \$500.

There is every indication that the collections for 1917 will run to \$275,000, as the same proportion of increase would give a total of 50,000 cars.

The estimated population of metropolitan Louisville to-day is 325,000; within a 20-mile radius, 400,000. The city is the largest exporting center in the world for tobacco and whiskies. It is the largest grain market in the country outside of Chicago, as well as the largest livestock market. Louisville also is the principal mahogany market and manufacturing center in America. Other great industries here are: agricultural implements, porcelain-lined bathtubs, paints, varnishes, cement, chewing gum, cottonseed oil, cottonseed oil products, organs, hardware, boxes, barrels, stoves, millinery, window shades and loose-leaf ledger supplies.

Totaling nearly \$1,000,000,000, an increase approximately of \$200,000,000 over 1915, the previous best mark, bank clearings in Louisville for the past year reached the highest figure in the city's history.

With the exception of 1914, when there was a decrease of nearly \$50,000,000, Louisville clearings have steadily increased since 1908, the year following the panic. Louisville's progress has been

rapid and substantial, and to-day the city's exchanges are in greater volume than a number of other cities of equal size or larger, including Indianapolis, Buffalo, St. Paul, Seattle, Denver, Providence, Columbus and Toledo.

Kentucky, with a gross area of 40,598 square miles, had a population of 2,386,866 on Jan. 1, 1917. There is only one automobile for every seventy-five persons in the Bluegrass State to-day, which indicates what immense possibilities Kentucky holds for the sales organizations of the automobile factories.

The principal crops of Kentucky in 1916 possessed a farm value of approximately \$187,531,590, an increase of \$58,267,000 over 1915. An increase of more than \$4,000,000 in whisky tax during the calendar year 1916 over the preceding year brought the grand total of internal revenue collections for the same period to a new record in the fifth district of Kentucky.

Leaf tobacco is bringing the highest prices in more than 10 years. According to the United States Department of Agriculture, Kentucky raised 435,600,000 lb. of tobacco in 1916, with an average farm value on Dec. 1 of 12.7 cents a pound or a total value of \$55,321,200. The crop of 1915 was estimated at 356,400,000 lb., and the average farm value on Dec. 1, 1915, was 7.8 cents a pound, making the total value of the crop \$27,889,200. Thus it may be seen that the crop of 1916, although only 79,200,000 lb. larger than that of 1915, had a value twice as great.

The corn crop was worth \$82,824,000, as compared with \$58,000,000 for 1915. Besides, the supply of live stock and its value and minor farm products rank far above those of 1915. Thus it may be seen that this territory is in possession of a tremendous buying power, and its business pursuits are less susceptible to the effects of the great war than those of many other parts of the country.

#### Hess-Bright Opens Two Branches

NEW YORK, Feb. 16—The Hess-Bright Manufacturing Co. has opened two branch sales offices—one for the eastern portion of the country at 1974 Broadway, New York, and one for the central section at 1036 Guardian Building, Cleveland. H. E. Brunner is in charge of the New York office and is assisted by H. A. Fonda. The Cleveland office is under the direction of R. E. Clingan, assisted by Walter Rippien and M. S. McNay.

#### Swedish Hupmobile Dealer in Detroit

DETROIT, Feb. 16—Seth A. Hoagmann, dealer in Sweden for the Hupmobile, is in Detroit. Mr. Hoagmann's headquarters in Sweden are Stockholm.

# Kansas City Tractor Show Breaks All Records

Bigger and Better Than Last Year's Show—S. A. E. Holds Banquet and Discusses Tractor Design—Construction Generally Improved—35,000 to 45,000 Machines Built in 1916

KANSAS CITY, Feb. 17—The tractor show is much bigger and in every way much better than that held a year ago. There is good reason to regard Kansas City as the natural center for a National tractor show, just as New York and Chicago are centers for automobile exhibitions. Great credit belongs to the K. C. Tractor Club, which organized last year's show and improved upon it this year. Composed mainly of dealers, it is none the less a body well qualified to talk tractor engineering, having a large share in the fund of available experience.

Simultaneously with the show the S. A. E. descended upon Kansas City and held a banquet on Feb. 14 at which over 160 tractor men were present. Talk centered upon the subject of standardization, prominent among the speakers being H. L. Horning, who has just been made chairman of the newly appointed tractor division of the standards committee. Tractor design is consolidating fast and it needs its standards to grow up with it; and tractor makers are ready and eager for the standards.

Tractors have improved astonishingly in the past year, in fact, it appears that some definite line of development can now be traced. A year ago tractor design was quite haphazard; there was no definite design that the buyer felt certain of. To-day the corner has been turned, and it is generally conceded that tractor design has started forward on a more definite line. There are in the show several old style machines built by the biggest makers, but it has been generally whispered that these big makers have in their experimental shops the new machines that correspond with the more advanced thought of tractor design. Two or three big companies, it is understood, are keeping such quiet until they are ready to bring out their new models.

## 1916 a Big Year

Last year was a big year in tractor-dom. The makers started out to build 50,000 tractors, but they did not reach the mark. The output ranged somewhere between 35,000 and 45,000 machines. Nobody seems to know exactly where, but all agree that the 50,000 total was not reached. For 1917 the makers are talking of 100,000 machines, but here again the conservatives claim that 70,000 will be the possible limit of the year.

The general consensus of opinion is that the four-cylinder vertical engine will

dominate the field, with a few six-cylinders perhaps for exceptionally large jobs. At present some large production concerns are marketing the horizontal two-cylinder design, but sentiment is that they are already over the fence and prepared to bring out vertical jobs. The vertical motor is placed longitudinally between the front wheels, much as in a truck or car.

To-day the four-wheel tractor gives evidence of also dominating the situation, but this path of development is not nearly so clearly defined as that of the vertical engine. There is more or less of an argument between the four-wheel designs and those using three wheels with a single wheel for steering in front. Both use practically the same arrangement of engine, clutch and power transmission with the two driving wheels in the rear. Those using the single wheel in front argue that they can turn in less space, which is very essential in farming; the four-wheel exponents argue that there is not sufficient weight on the single front wheel for correct steering at all times, and further than the three-wheel design is not so well suited for road work as the four-wheel.

There is very general agreement that two driving wheels are needed at the rear and that those designs using only one rear driving wheel are bound to go sooner or later. The argument is advanced that they upset too easily and that there is not enough weight on the steering wheel or wheels.

One of the biggest changes that came over the tractor industry last year was the more general use of kerosene and also the filtering of air entering the carbureter.

## Heavy Fuel Necessary

Of just as great importance as filters has been the more general use of a fuel a little heavier than gasoline. The farmers call it kerosene but it is generally a fifty-fifty mixture of gasoline and kerosene. It is hard to sell a tractor to-day unless it will use kerosene. A year ago there was no such demand. Then gasoline was relatively cheap, but the increase in price has quite changed the farmer's attitude. Now he demands kerosene whether he uses it or not. The tractor makers and the carbureter makers have risen to the occasion and provided devices that will handle kerosene, but even this is no assurance that such is being

used. The opinion is very general that very few farmers are using pure kerosene, but that most of them are mixing it with gasoline.

Engine makers have met many obstructions in refining their motors for tractor work using kerosene. They have found much pre-ignition which has resulted in a complete redesign of the combustion chamber so as to rid it of all hot spots which might lead to pre-ignition. This has been no small job, in short, has been a real engineer's task. Spark plugs have given trouble, but it has generally been remedied by better waterjacketing. The trouble of kerosene working into the lubricant in the crankcase has been largely overcome by better piston and ring fitting. The net result is that the tractor has had a very great influence on the automobile and the truck, and we are getting better car and truck engines.

There are many other ways in which farm tractors are being improved. The gearsets are vastly superior to a year ago, and now the rule is to inclose every part of a tractor as well as and better than on a car.

## Tractor Rating Unsettled

There are many unsettled points in tractor development and one of the major ones is tractor rating. In the early days of motor car design we adopted what was known as a horsepower rating equation, which has been generally used ever since, but which has not proved very satisfactory, and can scarcely have been called a complete success. In the tractor field they have what is known as a rating which includes draw bar and belt power, each tractor having a large pulley for belt drive, as often 50 per cent of a tractor's work is driving machinery by means of its belt. At present these ratings are too variable and already the makers have set to work to settle upon some standard system, so that all will talk in the same terms on this subject.

As to the eventual type of tractor little can be said, excepting commenting on the general statement that many think the eventual tractor will have to combine work on the farm with work on the road a little better than it does to-day. The tractors are generally designed to plow, harrow, draw binders, moving machines, seed drills, harrows and other tools for soil cultivation. But the farmer must transport his grains to the depot, and must do many other road jobs. One trac-

## Dealers in Kansas City Territory Need Cars and Trucks

Many Sales at Kansas City Show—Territory Will Need 80,000 to 90,000 Cars in 1917—Zinc, Oil and Agricultural Outputs Render People Prosperous

KANSAS CITY, Mo., Feb. 17—It is what the dealers can get—not what they could sell—that governs automobile buying in Kansas, Oklahoma and Missouri this year. A conservative estimate gives an increase of \$30,000,000 in business and this increase is based on what cars the factories have agreed to ship into this territory and not what the dealers could sell. Of over 100 dealers interviewed from all parts of this great country over 90 per cent made the statement that they would sell all the cars the factory would ship them and bemoaned the fact that their contracts were limited.

At the Kansas City automobile show which closed Saturday, a total of 204 cars and 44 trucks was exhibited. This was by far the finest show ever held in the Southwest and it could compare with the Chicago show both in magnitude and in the amount of business done. There was a gate attendance of over 140,000 people during the week and all records for outright buying and for placing of dealers were surpassed.

Unofficial figures place the attendance for the Kansas City show at 195,000; this is one-third greater than last year. The total number of dealers registered to date is 3300. It is estimated that 6500 dealers from out of town will register before the show closes.

It seems certain that Kansas, which added 30,000 automobiles to its registration last year, in the 12 months ending July 1, and which had 114,373 automobiles licensed on Jan. 1 this year, will want at least 50,000 more cars in 1917. Kansas will also take probably as many trucks as it can get.

Oklahoma, which gained 27,588 automobiles in 1916, or 116 per cent, and now has 52,239 registered, probably will buy 30,000 or 40,000 this year, maybe more—for it is said that most of the cars last year were sold to farmers, the cities not yet having made a corresponding increase.

### 102,000 Cars Needed

Missouri, which registered 103,587 cars in 1916, a gain of 31,000 over 1915, has already registered 69,143 in 1917, indicating a possible total for the year of around 140,000. In the Western half of the State, the 1916 registration was 58,035—the territory to which Kansas City distributes—so that it seems safe to mention 22,000 cars as the possible distribution from Kansas City to Missouri this year.

To keep to the exact figures of these guesses, this means about 102,000 cars—not counting trucks—which may be estimated as the distribution from Kansas City to its immediate territory; with good conditions, the number is likely to be largely increased in Kansas and Oklahoma, possibly to 130,000. Serious setbacks in agriculture, live stock or oil might reduce the total to 80,000 or 90,000 in the three States.

Surprisingly, the vast growth of the industry in this territory is thriving at this moment in the face of a rather poor prospect for the 1917 wheat crop, increased cost of cars and increased cost of living. Then why all the prosperity? People are buying now because the 1916 crop was a record breaker. The fortunes accumulated from this year of prosperity were not all spent. Moreover the people of the community are looking at a possible poor 1917 crop season as a fitting time to prepare themselves for another record breaker in 1918 and they are buying trucks and cars for two things. One is to give them the necessary motor equipment for intensified farming, the other is to give them comfortable passenger cars for business use in getting to and from the city and to give a hard working family its hours of pleasure.

The zinc and lead mining district of Missouri, Kansas and Oklahoma produced 34 per cent more in 1916 than 1915, or \$10,000,000, and the past year was a banner year in production, value and expansion of operations. The Joplin district and other larger centers are promising fields not only for automobiles, but for trucks—and there seems an especially interesting prospect for electric vehicles.

These figures into the new prospective wealth startling discoveries of vast quantities of oil under Kansas. The State is being drilled in practically every section and already there are producing wells which are making land owners rich. The oil boom is the talk of the territory and perhaps every third person is an investor in oil stocks. Furthermore, most of this invested money goes back into the development of the wells, purchase of supplies and all channels which tend toward rapid growth of the business. The United States geographical survey gives the following figures for Kansas oil production:

In 1909, 1,263,764 bbl.; 1910, 1,128,668 bbl.; 1911, 1,278,819 bbl.; 1912, 1,592,796

tor maker with this in mind has designed a machine with five wheels, two steering wheels in front and three wheels in a row at the back. The center back wheel is a very wide one for work in the fields, and at either side is a narrow wheel. In less than an hour the broad center wheel can be removed and wood tires fitted to the two outside wheels, thereby giving a very good machine for road work, with speeds claimed as high as 5 or 6 m.p.h., relatively high compared with speeds of 2 or 3 miles as needed in plowing.

Nobody feels very certain on this question of a combined machine for soil cultivation and road work. The farmer has bought his automobile, which often costs him as much as a tractor, and it is assumed that he will soon buy a truck, which should care for all transportation work. This would leave the question of tractor design solely up to that for soil cultivation with the necessary belt drive for running farm machines. With such an avalanche of converting devices for Fords, Overlands, Buicks, Studebakers and Dodges making them into light trucks, it will not be surprising to see these in very general use, and doing their part to powerize the farm.

One tractor maker has developed a two-wheel design which occupies a similar position to that of the tractor used in the truck field, which is a very short four-wheel machine designed to have the front end of the trailer carried on it. In the farm tractor field this maker has a two-wheel machine incorporating the engine, transmission and everything that goes with it. This two-wheeler can be hitched in front of a mowing machine, a binder, a set of plows or any other farm implement.

### Starr Leaves Overland to Go with Leavitt

LOS ANGELES, CAL., Feb. 17—L. V. Starr, manager of the Overland branch here, has resigned after 6 years' connection with the company. O. B. Henderson has been named as acting manager. Mr. Starr joins J. W. Leavitt & Co., former Overland distributor in California, whose interests were purchased by the Willys-Overland Co. for \$1,000,000, as vice-president and one of the directors. Mr. Starr will be in charge of affairs in the southern half of the State, and A. D. Plughoff, another vice-president and director will be in charge in the north.

### U-S-L Changes

NIAGARA FALLS, N. Y., Feb. 15—J. A. White, formerly manager of the Boston and Chicago branch offices of the U. S. Light & Heat Corp., has been appointed manager of sales of the battery department with offices in this city.

W. W. Halsey has been appointed manager of the New York sales office.

bbl.; 1913, 2,375,029 bbl.; 1914, 3,103,385 bbl.; 1915, 2,823,487 bbl. This is a total of 28,974,071 bbl. The estimated future production of 40,000,000 bbl. has been entirely abandoned due to the recent discoveries of vast new fields.

#### Grain and Stock Raising

Kansas City territory is primarily a grain and stock raising territory. Furthermore there is a great acreage suitable for farming which is still undeveloped. In districts where rainfall is slight and winds are high and frequent, it is now being realized that mechanical tilling of the soil by use of tractors will permit of exceedingly profitable crops, therefore, in another year or two we will find in this territory not only intensified mechanical farming on farms already developed, but we will find the opening up of great new fields. The values of the 1915 and 1916 crops in Kansas, Oklahoma and Missouri are as follows:

State	1916	1915
Kansas ...	\$314,453,000	\$260,517,000
Oklahoma .	223,723,000	171,774,000
Missouri ..	260,049,000	239,399,000

There are your figures for that bumper year. Kansas value has increased over \$53,000,000, Oklahoma over \$51,000,000 and Missouri over \$20,000,000. There is little wonder that the farmers are willing to spend some of this money on cars.

Looking on the worst side of it first, let it be mentioned that Missouri's gain was largely brought about by unprecedented high prices. There is less possibility in this State, as its acreage already cultivated takes in about all the available farm ground, however, the eastern part of the State has had bad corn seasons for 2 years.

Kansas has an increased acreage of 2 8/10 per cent in the winter wheat this year or a total of 8,887,000 acres. There has been a shortage of moisture and the excessive winds help to blow what little moisture there was out of the soil so that the crop loss this year is going to be in the neighborhood of \$30,000,000 from present indications. However, this may be considerably decreased by planting other crops on the same ground. It is claimed that practically all of this loss could have been done away with had the farms been tractor instead of horse equipped. The proper time for plowing last summer was during a spell of excessive heat when it was not humane to take the horses out of the barn. Because of this fact the crop was plowed late and at an unfavorable time.

Corn and hay must be considered in connection with live stock and the 1916 year live stock growing in the Kansas City territory was almost unbelievably large. In fact while the production was increased well over normal, the profits were abetted by the highest prices ever seen from all classes from prime fed to

stockers. Receipts of cattle last year were 2,177,468 head against 1,860,235 in 1915. Furthermore January, 1917, prices exceed the levels of the same month of a year ago.

Comparison of prices the first week of February with the same week in 1916 shows about 30 per cent increase all down the line. While commission men had feared a slump in the receipts in the first 6 months of 1916, the arrivals are still holding up and every beef animal sells from \$15 to \$35 per hundred more than a year ago.

Last year gave another record in sheep as to the total money paid although the total production was lower. Receipts of hogs were nearly half a million larger than in 1915 with a total of 2,978,933; and prices rising nearly \$4 per hundred during the year. The prices of hogs on the Kansas City market this month reached nearly \$1,250 against \$830 of a year ago, or \$9 to \$12 apiece more for the hogs coming now.

The government reports a loss of 1/2 of 1 per cent in the hog crop this year. Official figures on the hog crop population of Kansas, Oklahoma and Missouri are:

State	Jan. 1, 1917	Jan. 1, 1916
Kansas .....	2,535,000	2,815,000
Oklahoma ..	1,372,000	1,491,000
Missouri ....	4,280,000	4,505,000

#### Freight Car Shortage Felt

The Southwest is feeling the effects of the freight car situation fully as strongly as any other section of the country. Out here it is attributed more to the fact that the railroads cannot supply locomotives to get the cars to them even more than to the shortage of cars. Several dealers in Kansas City are already making plans to drive cars through from Detroit factories. So great is the demand that they will take cars completely disassembled and build them up at their own expense.

#### S. A. E. to Push Standardization of Tractors

KANSAS CITY, Mo., Feb. 14—Tractor standardization was put on the S. A. E. map here to-day when the Society of Automotive Engineers staged a dinner which 162 representatives of the tractor interests attended. It was a fitting time to start such work as the second annual tractor show is being attended by all of the biggest tractor builders in the country.

H. L. Horning chairman of the tractor division of the standards committee held the first meeting of his tractor division in this city and at once decided on twelve lines of standard work connected with tractors. Here they are:

1—Standardizing tractor rating just as the S. A. E. rating applied to horsepower. At present there is no uniformity

in tractor rating scarcely any two using similar ratings.

2—Standardizing tractor specifications the same as the National Automobile Chamber of Commerce has settled on certain specifications of automobiles in its year book.

3—Standardizing impulse starters for magnetos, so that the same impulse starter can be fitted in different makes of magnetos. The magneto is practically universal for tractor ignition and the impulse starter is in much demand.

4—Standardizing the height of drawbar for attaching plows or other apparatus used on farms.

5—Standardizing tractor speeds. At present tractors travel at different speeds but it is deemed essential because of plowing to have a standard tractor speed for such work.

6—Standardizing width and diameter of tractor pulleys for belt drive. As often 50 per cent of a tractor's work is belt drive, this feature is important.

7—Standardizing drawbar connections so that no difficulties will arise when attaching different loads.

8—Standardizing magneto couplings for tractors.

9—Perhaps extending flange sizes for carbureter attachments.

10—Endeavoring to reduce the number of diameters for bolts and nuts in tractor use.

11—Standardizing motor fans and fan capacities.

12—Doing something to adopt recommended practice with regard to connecting-rods for tractor motors.

Among those present at the meeting were: Fred Glover of the Emmerson-Branting Co., Rockford, Ill.; F. E. Eason of Hyatt Roller Bearing Co.; E. R. Grier, tractor engineer of Oklahoma City and Herbert Chase of the S. A. E., New York. Chairman Horning is writing all tractor makers regarding standardization work. The present committee will be enlarged as soon as the work gets under way. tractor engineers will be added.

#### Southern Chevrolet Opens in March

DETROIT, Feb. 19—The plant of the Chevrolet Motor Co., at Fort Worth, Tex., will commence operations in March. The Chevrolet Co. expects to produce a total of 540 cars a day by that time, its daily output now being 400 cars. The schedule now outlined calls for 600 cars a day by July 1.

#### Fisher Tool Holds Meeting

DETROIT, Feb. 19—The Fisher Tool & Supply Co. held its regular annual meeting last week and elected Roy Fisher president, Ralph Hoagland, vice-president, and sales manager; and Herman Fisher, secretary and treasurer.



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## The Competition for Labor

THE past 3 years have completely upset the industrial world. In 1914, employers were burdened with a surplus of workers and suffered from a famine of business. They were engaged in a keen competition for orders and in common enjoyed a sufficiency of labor.

To-day, the situation is reversed. Business with its unprecedented prosperity has eliminated the rivalry for orders—every factory is operating to capacity—but employers now suffer a famine of labor. They are forced to compete for workers.

This condition is an important factor in the existing alarming labor turnover. Workers, realizing that positions may be had for the asking, are changing jobs daily as the various manufacturers offer increased advantages in the form of high wages, welfare systems or profit-sharing plans.

### Need for Successful Plan

These inducements work well for the company offering the most. They are extremely injurious to every other concern in the community. And none of these plans devised to catch the worker and reduce the turnover, has actually been successful, sound or substantial in its entirety.

That company which in its experiments enters into a high-wage or profit-sharing scheme will eventually encounter difficulties. The company cannot always continue the high wage or grant the huge

share of profits and will find its employees drifting away dissatisfied, discontented and sullen because having once been taught a fairly high living standard, they must again lower it when the incomes decrease.

### Ford Plan and Competition

In addition, these schemes are only palliative. They are too much like the medicine that temporarily reduces fever, but has no important effect on the disease that produces it. For example, the Ford Motor Co. has succeeded in reducing labor turnover. It has granted a high wage in the form of profits that has attracted workers. And for the time being the plan may be considered successful though its cost is very high. But imagine the result if every automobile maker in Detroit offered similar wages and advantages. The effect would again be a competition for labor—on an equal basis—at an unreasonable cost plus the same high percentages of turnover as exist now.

When some large employer discovers a plan for retaining workers and for making them content, that will possess the same benefits though all employers adopt it, he will have succeeded in solving a problem that now confronts every manufacturer.

## Electric Prices

THERE are two diametrically opposed ideas on the proper field of the electric. One class is represented by those who say that it is impossible to sell a low-priced electric and the other by the manufacturers who are doing everything possible to bring the electric car into the range of moderate prices.

Undoubtedly there is a certain class of people who will buy a certain object simply because it is expensive. These same people buy automobiles as they would clothing, furniture, or anything else by price rather than by an examination into the return for the money. With an electric the first price has no bearing on the upkeep cost. With a gasoline automobile the more expensive a car the more it costs to run because it is generally heavier and larger. There is a very good reason, then, for buying the best that the market affords when purchasing an electric.

### The Optional Equipment Factor

At the same time it is not fair to assume that people wish to pay for the indulgence of the tastes of others. Where a concern offers a wide range of options in mechanical details and in upholstery and finish, the price must go up. Standardized production ceases and price goes up not only to the man who takes special fittings but to the other who takes the stock job. The difference in the policy of different manufacturers on the matter of optional equipment is important because it is this policy which governs price to such a large extent. It is doubtless true that the man who buys an electric wants quality, but it remains to be seen if he wants this quality at the lowest possible price or not. Standardization in design and in manufacturing methods may always be expected to produce some effect on prices.

# MANUFACTURERS' Manufacturer to Distributor, Dealer, Buyer MERCHANDISING

*Third Article of  
The Automobile's  
New Department*

## Farm Tractor Field Offers Big Opportunities to Manufacturers of Parts and Accessories for Cars and Trucks

**A** FEW days spent at the Kansas City tractor show held in that city last week was sufficient to convince us that many manufacturers are hopelessly behind in the question of farm tractors. Thanks to a few of our very progressive makers of parts, components and accessories, the farm tractor business has developed as it would not otherwise have done, but while perhaps 1 or 2 per cent of our automobile parts makers have grasped the possibility of the tractor business the others have apparently scarcely even heard of it.

### *1,000,000 Tractors Needed*

The tractor business offers good possibilities for the makers of parts from motors all the way down through the gamut. Last year approximately 40,000 farm tractors were built. This year may see 70,000 built. It is estimated that we will need in the next few years nearly 1,000,000 tractors. Various estimates have been made as to how many farm tractors will be needed in the country. The figure has been placed at 1,500,000, but it is just about as sensible to make that estimate as an estimate made 10 years ago on the number of automobiles that could be sold would be sensible. There are 6,000,000 farms in the country and naturally everybody looks forward to the day when every farm will have a tractor. We also look forward to the day when some farms may have two or perhaps three tractors. The entire possibilities are so great and the future so uncertain that it is impossible to estimate what even the home demand will require. Then there is the foreign field which has big things in store. The American farm must be powerized and the farms in foreign lands will also have to be tractorized.

### *Leads to Better Car and Truck Engines*

There are many possible fields for the parts maker in the tractor business. Already two or three aggressive engine builders have become well established in the tractor business and the names of automobiles are better known in the tractor field than the names of motor makers not building for the automobile trade. These motor makers from the automobile side have done excellent work. They are making better motors for farm tractors than they built for automobiles or motor trucks. They have built better motors because they had to. The service on a tractor motor might be expressed as 100 per cent load all of the time. There is no coasting with the tractor motor, no let up from start to finish, excepting when plows are lifted out of the ground at the end

of a field, and when other farm implements are similarly briefly relieved from service. On the other hand the motor in a motor truck might be said to be working at its average for 45 per cent of the time; and going a step further the motor in a passenger car has only about 15 per cent of heavy service. As a result we have had to have better motors for tractors than for trucks or automobiles; and here the new industry is making the older industries better. We will have better truck motors because of the tractor industry and better automobile motors because of the tractor business. Here is how this works out: The farmer has demanded an engine that will use kerosene and of course the tractor maker has been compelled to give him motors that will do something with this fuel. As a result motors have been improved and better work done on tractor motors than on truck motors. The combustion chambers have been improved in design to remove hot spots which became impossible under 100 per cent tractor service but which got by with the light service in trucks and automobiles. Then, too, better piston and ring fitting has been necessary in order to use a fuel that if not all kerosene has been perhaps half gasoline mixed with half kerosene. The kerosene has worked havoc with lubricating oils and better engine workmanship has been necessary to prevent this.

### *Magneto Service on Tractor Is Hard*

What has happened with engines for tractors has happened with other parts. Magneto service on a tractor is much harder than on a truck. Better lubrication is necessary, as well as better prevention from dust. The tractor works in a cloud of dust and so calls for 100 per cent efficiency in dust prevention.

Carbureters have had to be much improved and during the past year the air filters have been developed and perfected to a workable extent. These dust filters remove pints of dust from the air passing to the carbureter in a single day. Every tractor must have an air filter. There are several on the market but there is room for more.

Hand in hand with air filters has been the demand for devices to handle kerosene, or at least a fuel heavier than the gasoline used in automobiles. The application of heat to the entering air has been followed by many but this method cuts down the volumetric efficiency and a tractor engine requires all the efficiency it can get. Here is room for invention and development.

There are literally scores of features in connection

with the tractor trade which afford opportunities for parts makers. One of these is in the development of a good gearset for tractors. Such a gearset may afford only one speed ahead or in a few cases two. It must have a reverse. A year ago many tractors used cast gears, but cut gears are coming into use. There is a good field here. The firm taking it up must make a thorough study of tractor requirements and we would recommend that they follow the circuit of tractor demonstrations that will be held this year. More mistakes have been made by automobile makers jumping into the tractor field imagining that what was right for the automobile was right for the tractor. They found out later to their sorrow the error they had made and then had to go over their steps and learn the tractor business. The same will happen again unless those entering the field make a careful study of it.

#### *Tractor Wheels*

The manufacture of tractor wheels offers a good field for some maker. At present there is not a symptom of standardization in this work. No two makers have got together on this. There is no better time to get into such a field than the present.

As yet nothing has been standardized with regard to slide frame members for tractors. There is nothing definite as to the style of member needed, in fact, none of the makers know exactly what is needed. Unquestionably some of our automobile frame makers could better solve this than tractor builders. With 70,000 tractors in the making for this year the field should be attractive enough for automobile frame builders to investigate.

At present all tractors have not front axles but a good many of them have and more will be using front

axles, but a good many of them have and more will be using front axles in the next year or so than at present. To-day there is no uniformity in axles: One machine uses a tubular, another a made-up axle resembling bridge construction, and others different forms. It is observed that the same maker building two similar tractors but in different sizes uses different designs of axles. Unquestionably front axle design in tractors will follow some definite line and that automobile parts maker desiring to get into this field should do so to-day. Again let us repeat that it will be a wise maker who carefully investigates tractor work and does not jump in without making a thorough examination.

There is a hopeless lack of standardization in frames for tractor engines. The fan on the tractor engine has a big job to handle. The fan gives trouble, as does the fan drive. There is no logical reason why fan manufacturers catering to the automobile trade should not supply the tractor trade.

The question of wider use of pressed steel parts for tractors has received very little attention. There is no end to the use of such parts.

The motor hood follows similar lines to that used on the automobile. There is the motor underpan, which gives promise of broad improvement. One maker has already combined the tractor frame and the motor pan in one. It is a very fine job. Then there are guards for the wheels, pressed steel seats and a score of other pressed steel parts.

#### *Steering Gears Need Standard*

Tractor steering gears are not as standardized as those on cars and trucks. There are many varieties. Unquestionably some more standard form will be adopted. Several makers are waiting for such.



Banquet held by the Society of Automobile Engineers during the tractor show in Kansas City. Tractor design was discussed



# New Rotary Valve Engine Design

Van Keuren Has Single Water - Cooled Valve  
Lubricated by Oil in Gasoline—Production Cost Low

**T**HE Van Keuren mono-valve engine which has been under development for some time is about to undergo tests in one of the Detroit laboratories. The engine is interesting, as it represents a development of the idea to which inventors have clung for some time. This is the use of an overhead rotary valve. The stumbling block over which most of the designers have tripped and fallen has been in the failure properly to cool the valve, with the result that warping soon occurred, and consequent failure of the engine. To overcome this objection in this particular engine, the cooling water is free to circulate through the entire length of the overhead cylindrical valve.

## Drive Chain Tension Adjustable

The mono-valve, as the name indicates, is an engine with but a single valve controlling the functions of all cylinders. The valve is a rotary type, revolving at half crankshaft speed and driven by a high-speed,  $\frac{1}{4}$  in. by  $1\frac{1}{2}$  in. chrome-nickel steel roller chain. The tension on this chain is maintained by an adjustable sprocket on an additional drive shaft which is used for the magneto. The particular advantage claimed for the construction is the same as that claimed for other engines of the same type; namely, that it has less moving parts than the ordinary type of poppet valve engine, with the same number of cylinders.

The advantage of a single rotary valve engine over the poppet, as advanced by the inventor, is chiefly in the reduction of the number of parts in the valves themselves and in the valve action, including springs, etc. Another advantage is that there is an equal performance of the valve at all speeds.

In the mono-valve engine, which in this instance is 3 by 5 in., the diameter of the rotary valve is  $2\frac{1}{4}$  in., and its peripheral speed is about three-tenths of the piston speed and about fifty-one one-hundredths of the peripheral speed of the main and connecting-rod bearings. The valve is lubricated by mixing the oil with the gasoline. About 1 pt. of oil is mixed with 5 gal. of gasoline.

One of the features of construction of the engine, is that

the cylinder block is suspended from the valve cylinder. In this way all upward reactions are transmitted to the valve and the valve operates under about 60 lb. maximum pressure per square inch of bearing area. The purpose of this is to allow the cylinders to seat upon the valve members and maintain gas tightness in the cylinder ports. In other words, the seating is directly opposite to the poppet valve type as the cylinders are brought to their seat instead of the valve. To eliminate carbon troubles which have also been prevalent on overhead rotary valve engines, the valve is so shaped as to scrape the carbon from the seat as it is formed.

Another feature of an engine of this type is the possibility of obtaining proper combustion chamber form. In this case, the chamber is conical and machined all over. The spark plug at the side fires directly into the charge. The inventor also claims that the valve never needs grinding.

Some of the data regarding the specific engine which has been made up are given in the following:

Cylinder—Size 3 in. by 5 in.

Piston displacement, 141.4 cu. in.

Horsepower at 2750 r.p.m., 35.

Horsepower at 1750 r.p.m., 23.

Valve System—Half speed internally water-cooled, chain-driven rotary.

Valve-lubrication—By means of fuel spray (area of valve exposed to spray,  $12\frac{1}{2}$  in. by  $\frac{3}{4}$  in. = 9.5 sq. in.

Cylinder Port— $1\frac{1}{4}$  in. circular gives a port opening of 17.35 per cent of the piston head area.

Timing—Conservative,  $23\frac{1}{2}$  deg., exhaust lead and the same intake lag.

Pistons—Two-ring type, aluminum alloy. Piston assembly weighs 15 oz.

Connecting-rods—Very light  $10\frac{1}{2}$ -in. rods.

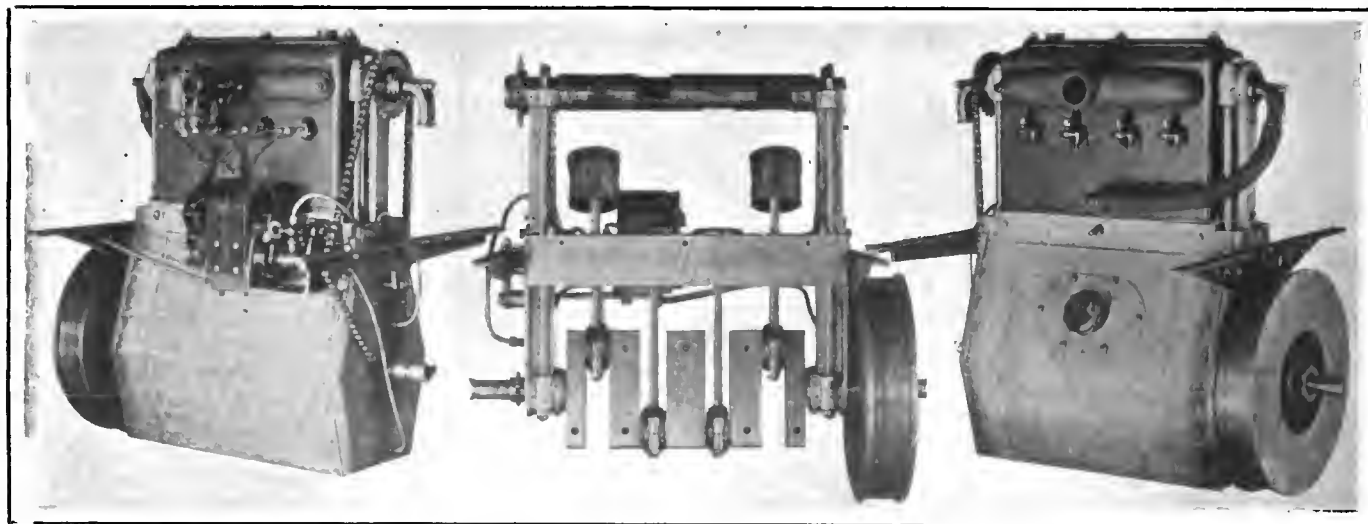
Crankshaft—Two counterbalanced bearings,  $1\frac{1}{8}$  in. diameter.

Crankcase—Sheet steel.

Lubrication—Force feed, non-splash gear pump.

Ignition—Magneto.

Cooling—By pump or thermo syphon.



Left—Exhaust side of Van Keuren mono-valve engine, showing exterior water pipe passing through the center of the valve. Center—Method of supporting rotary valve. The cylinder block is supported on the valve and sets itself against it. Right—Intake side, showing valve chain drive carburetor mounting

# Engineering Progress Analyzed

## Part II

### Body Details Could Be Improved—Workmanship Not Up to Par—Other Comments and Criticisms

By J. Edward Schipper

Technical Editor, THE AUTOMOBILE

**EDITOR'S NOTE:**—This is the second installment of a paper presented before the Detroit Section of the Society of Automotive Engineers Feb. 16 in which Mr. Schipper summarizes the results of an extremely close analytical study of 1917 cars.

**I**N tire equipment there is an increase in the use of the straight side type. Another noticeable feature at the shows was the large number of non-skids fitted to the rear as stock equipment. The cord tire is given on a larger percentage of chassis and in a lower price field than was the case a year ago, and it is noticeable that while car weights have been going down there has not been any great tendency toward a decrease in the size of tires, showing a tendency more toward overtiring than in the opposite direction.

#### Bodies Not Satisfactory in All Particulars

Bodies are not altogether satisfactory. There has been a great improvement during the year in the proportionment of space, particularly as regards the front compartment, but there are many instances where it must be said that the driver's seat is actually uncomfortable. In some the driver is quite comfortable after he has seated himself, but during the process of entering and leaving the seat he is a very uncomfortable individual. The point is that a large man physically may often buy a low-priced car and he is the last man to believe that the room in the driver's seat should be proportional to the price paid.

Naturally a longer wheelbase is to be expected on the higher price car, but with reasonable proportioning and care in working out the position of the pedals much can be accomplished. It was interesting to watch some of the taller individuals who were invited to sit in the cars by the ever-alert salesmen. If the salesman were wise he would invite the more lengthy individuals to sit in the tonneau because there were several instances where the knees would come against the lower rim of the steering wheel. All in all, however, the situation, in this respect, is not so bad as it was a year ago. In fact there are a few cases where very good proportions exist in this respect and where one of the big selling arguments of the car was its driver's space. The driver is the owner in such a large proportion of the 3,000,000 cars on the road that he deserves considerable attention. He is the man that pays for the car, and should have as much comfort as his guests who occupy the tonneau.

A very high percentage of cars are sold by the body and therefore the designer should be afforded every opportunity to make the best job he can. This is being more appreciated every year. There was more variety in the bodies at the show this year than last. At that time practically everyone was striving for the molded form which may be said to approach the cylindrical. This year there are a number of prismatic designs in which the side line of the hood is left sharp and distinct. The effect of this variety is pleasing. Regardless of how we like a certain type of design, it is a psychological fact that we lose our appreciation for it if every other design is similar. Variety is stimulating and it must be said that

this effect was much more notable this year than for several years in the past.

#### Greater Variety of Color

From a superficial inspection of the color designs at the shows, the impression is gained that manufacturers are looking for other colors than black. The colors must be durable and that is the stumbling block of the brighter combinations. There are a number of grays and greens, however, this year and they afford a pleasant relief. Probably if the truth were known some of these other colors are not much more difficult to take care of than the more sombre black. At any rate it is noticeable that colors other than black are more numerous among the straight stock jobs than for some time in the past.

There is an increase in the number of four-passenger cars and a falling off or practical vanishing of the three-passenger cloverleaf type. The four-passenger cloverleaf of to-day is really not a cloverleaf at all, strictly speaking. If it were, the rear passengers would not have enough room. This was the objection last year and designers have given up the idea of cramping the rear passengers simply for the sake of having the body a true cloverleaf. The four-passenger roadster, which preserves the roadster lines with doors only at the front and with entrance to the rear through the aisle between the front seats, is very popular. There were a number of them at the show and they were always surrounded by groups.

While on the subject of bodies at the show a brief mention of the salon idea should be made. There is a class of purchasers who desire individuality in cars just the same as they do in clothing, shoes or in other lines. Some of the biggest dealers have increased their sales and their profits by putting custom made bodies on stock chassis. The salons at New York and at Chicago were well attended and the proportion of actual buyers to attendants is far higher than at the big national shows. In New York one rebuilt British chassis fitted with a fine example of the custom body builder's art sold off the floor of the Astor for \$14,000. This same idea carries back through all the price classes. On the street at New York, just outside of the Grand Central Palace, there was a row of cars fitted with some exceedingly neat speedster bodies painted attractive colors. These sold at an advanced price and although the chassis is one that is very low in price, these little cars with their attractive bodies appealed to a very high class of buyer.

#### Door Fitting Could Be Better

There is room for improvement in door fitting, according to an inspection of even the carefully prepared show bodies. On one side the doors would be tight and on the other, loose. The shape of the center cowl may also be improved and one car showed a real use for the center cowl by providing in it a

place where the rear windshield could be housed when not in use. Many at the show believed that the rear windshield is coming and it has been said that once it is used, the user never wants to be without it.

Another place where improvement is suggested is in the contour of the upholstery of the back of the seat. After sitting in perhaps fifty or sixty different cars at the New York and Chicago shows, the different effects of the shape of the seat back cannot help but strike one as important. In some the bulge is too high, in others too low. In some it is necessary to sit exactly vertical and in others one actually leans forward if sitting well back in the seat. The most comfortable position seemed to be a slight backward lean with the bulge in the leather fitting the natural curve of the back. Care seems to be particularly necessary where the seat has a pronounced rake, as it is with these that the forward lean is imparted if the curve of the back is not correct.

The arrangement of the extra two seats on the seven-passenger car is better this year on some cars and not very good on others from the standpoint both of appearance and comfort. One maker folds his extra seats under the rear seat, giving perfect concealment. Another maker of four-cylinder cars has a particularly good arrangement with well-upholstered extra seats. These fold into a deep center cowl. One of the particularly good features about them is that the backs are amply padded. A long ride in seats such as these is not the rather painful experience that it is on some of the hard seats without proper backs.

One last feature which needs only mention, as its practicability seems well realized, is the car for all times of the year. For the man who travels with his top up in summer, the permanent top type is supplied, and for those who like nothing but the blue sky overhead, are convertible types.

#### Novelties at the Show

There is always a novelty or two at the shows. This year at New York there was a front drive car, which drew much attention. The steam car, which is not new with us but which for some time has been absent from the floors of the Grand Central Palace and the Coliseum, was always surrounded by throngs. Another newcomer at New York had a sixteen-valve overhead camshaft engine and still another showed an electric which was simplicity personified, the motor being mounted directly on the rear axle, acting both as a driving unit and as an electric differential.

On the front drive car a stock power plant is used, with the engine mounted as a unit power plant in the usual manner, but the drive transmitted forward to a live front axle. There is a dry disk clutch within the bell housing, and the clutch shaft, instead of transmitting the drive directly to the main shaft of a gearbox, carries a worm. This meshes with a Hindley worm wheel with floats on the differential housing. From this wheel the various reductions are obtained by an orthodox gearbox mounted transversely across the front of the car directly below the worm gearing. All the weight at the front end is carried upon a dead axle with the live axle transmitting the drive from the gearbox and differential, mounted flexibly on each side of the transmission unit. There is a universal at the point where the driveshaft leaves the gearbox and another at the point of connection to the front wheel. This gives a full universal action for the driving member and permits of free steering, which is accomplished by a central pivot located directly in the axis of the wheel.

#### Some Miscellaneous Comments

It seems fitting that a plea for better workmanship, particularly on bodies, should be made. The buyer of to-day looks into the matter of careful workmanship to a greater extent than is realized by many who deal with the manufacture of the car rather than its sale. The exterior outline has been given a great amount of attention, but just as in buying a

house the purchaser looks not only at a beautiful exterior, but also at the fitting of the woodwork and at evidences of the care with which the trimming is applied. We have a firm foundation in the chassis, a beautiful piece of architecture in the body; now let us have fine workmanship in the interior.

One of the comments which were overheard at the shows is in the growing size of the vacuum tanks. Some of the eight-cylinder cars carry tanks which are particularly large and of which the weight must be considerable. A suggestion which has been made and which may be of merit is that the vacuum tank could be built directly into the cowl. There does not seem to be any necessity for having a cylindrical tank; at the same time a flat cowl tank, having a capacity of a gallon with the vacuum feed system incorporated, would not take up a great amount of space and also would have the advantage of having a good supply of fuel close to the engine, where it has a chance of becoming warm.

In connection with the matter of body space, the distinct increase in the number of tilting steering wheels should be mentioned. One of the most difficult parts of body design is to observe all the correct proportions and at the same time allow of easy entrance into the driver's seat. The tilting steering wheel overcomes this problem very neatly, and one of the points upon which favorable comment may be made is in the increased number of these in use on the stock cars exhibited at the national shows.

A point which would bear the light of discussion is the use of leather substitutes for upholstery. Some of the big production concerns are able to purchase leather in such enormously large quantities that they can use the true product for upholstery. However, there are others who believe that some of the substitutes can be used just as satisfactorily. The cars produced in 1915 used a considerable amount of this artificial material, and on the whole it cannot be said that it was satisfactory. It cracked in cold weather, soon lost its luster and peeled wherever any chafing existed. The cars of 1916 have not shown these difficulties up to such a large extent. It may be, of course, that they have not been out long enough, but with the growing price of leather the question of leather substitutes becomes highly pertinent and is one upon which every manufacturer must be fully informed.

#### A Few Criticisms

Progress has been made in all departments, and there is room for improvement in all. The three fundamentals, performance, comfort and appearance, mentioned at the beginning of this paper have all been in the minds of the designers, and the results are reflected in the trends noted.

We have a few weak spots such as chassis lubrication, pedal layouts, incompleteness in finish of the body trim and in the handling of the fuel situation. The first mentioned is probably one that is least studied and yet, from the car owner's point of view, is the most important. In one make of car shown at all the shows in beautiful sectional chassis form there are five grease cups under the car, at the center where the driveshaft is divided, and not one can be reached handily except by climbing beneath. There are others who have studied this subject to some extent, and a few are substituting oil instead of grease, a practice which may grow.

In pedal layouts, the position of the clutch pedal and the accelerator are the two worst offenders. It is very difficult to put the foot quickly upon some of the clutches, and for driving in traffic an uncomfortable clutch is very bothersome. The accelerators on some cars are sufficient to give the driver housemaids' knee, or some other uncomfortable affliction after a long drive. One maker showed an accelerator with which the foot can be always kept flat on the floor, the pedal moving sideways for speed changes. This seems to have possibilities, as the greatest strain with the ordinary accelerator comes from the necessity of having the foot resting continually on the side or on the heel.

# Foreign Trade Department

## U.S.A. Financial Arrangements in Foreign Trade Compared with European Banking Facilities\*

By L. J. Burnes

*Foreign Department, National City Bank*

**T**HE financing of exports as discussed these days seems to be some mysterious process carried on by our competitors in Europe in their export trade, which enables them to far outdistance us—a method with which we are supposed to be not acquainted, and thus in no position to compete for the trade of the world.

We hear much of the long-term credits allowed by Europe, and, from various sources, the way this or that nation does its foreign business in a manner far superior to our own.

One would judge that we were hopelessly lost in the race, but this is not the case if we look at the increasing sales of American goods abroad.

The writings and speeches on the subject of export trade which have been placed before the public during the past year are not intended as a wholesale criticism of the nation in general, but have as their object the awakening of manufacturers in the United States who have not heretofore done an export business to the possibilities that lie before them in the future and the necessity of preparing for these opportunities by a knowledge of the subject.

Export financing in Europe is older than in the United States by force of circumstances and by such circumstances therefore more fully developed. The principles, however, are the same the world over: There must be in the transaction the following elements:

### A Buyer—A Seller—Money—Credit

It is the last factor which seems to be the subject of complaint about the United States. That we don't give freely of it is the charge against us, and it is the one thing on which a good export business in manufactured products depends, the thing by which Europe has developed its clientele in foreign countries, not that Europe has lavished credits for years on buyers throughout the world without making them pay for it or without suffering losses. It does neither of these things, nor does the foreign merchant expect credit without paying for it.

Many firms in the United States have for years been doing a large foreign business on terms equal to those extended by Europe. However, the customary method of other manufacturers in beginning their export trade seems to be, where they can sell on the basis of a sight draft with documents attached, not to give anything else.

Such a method will not develop trade unless the foreign buyer needs you very much; as soon as he does not, he goes elsewhere where he may get credit.

There is some justice at the present time in this stand on account of prevailing conditions, but we are now thinking of the normal conditions which will arise at a later date and will have to change a little.

Under normal conditions export financing is conducted from the United States more or less as follows:

A merchant or manufacturer at home sells his articles to the foreign markets.

1st—Through export houses both here and abroad,

2nd—Through his own salesmen,

3rd—Through agents appointed in different places,

4th—Through large importing houses in the foreign country, who know the credit risks and have their own force of traveling salesmen,

5th—Through getting in touch by mail with large houses in foreign countries,

6th—Through advertising,

7th—Through the Department of Commerce, as well as the commercial department of our bank, which puts at the disposal of the American exporter the service of placing him in touch with possible buyers in the foreign country.

8th—Through the establishment of direct agencies.

### Selling Through Export Houses

When selling through export houses, the merchant in the United States as a rule gets cash for his merchandise and thus takes no further interest in the transaction, but the export house does not sell for cash, but for credit, and what it makes on a transaction is to pay for its having built up a system which enables it to know who in a foreign country is worthy of credit.

All the other systems of selling mentioned mean that the seller in the United States must make his transaction based on giving credit to the buyer abroad, and a knowledge of his customer must, or should, be his.

The mere fact that a foreign buyer promises to pay a sight draft with documents attached drawn on him is no guarantee to the exporter in the United States that he is dealing in all cases with a reliable concern. In some countries the goods may be secured without the production of the bill of lading or the filing of a bond as we know it in this country.

### Not Behind on Foreign Credits

It has been claimed that we are behind in this country on foreign credits and that this has hampered foreign business. This is not entirely true. The mercantile agencies, as well as the banks in the larger cities, have always had in their files information on many firms in all parts of the world, but cannot force detailed information when it is not freely given as is the custom at home. The reports received from foreign countries are not as exhaustive as those that are available at home where banks and mercantile houses freely exchange credit information. Furthermore, it would not be possible for mercantile agencies and banks to anticipate just what information was wanted. Credit service follows the manufacturing exporter as he opens new territory and must be a matter of development. Europe has been in a position to better us in some respects because they have long exported of necessity and because many more European houses and banks have established branches in foreign countries while we were busy developing at home.

\*This is a digest of the paper on financing of exports read by Mr. Burnes at the convention of automobile export men recently conducted by the National Automobile Chamber of Commerce.

After the matter of credit come the terms on which goods are sold, and they vary according to circumstances.

Europe generally buys on fairly short time, many merchants paying a sight draft drawn on them with documents attached. Others demand and get time. Our grain trade, for instance, with Europe is conducted on a C. O. D. basis. Flour is sold on a basis of 60 days' credit, but the documents are not surrendered until the payment of the bill. Cotton has always been sold against reimbursements by the foreign seller in the form of a 90-day sight draft on a European bank. Manufactured goods are usually sold on long terms, and it is not customary to reimburse the exporter by a bank acceptance.

#### 90-Day Sight Drafts in S. A. Trade

Trade of all kinds with Central and South America is done on the basis of 90-day sight draft in practically all exportations.

With China and Japan trade is done at various terms according to custom; also with Australia, India and other countries, but outside of certain raw materials it is safe to say that all manufactured articles are sold on time.

Previous to 1914, most of the transactions with foreign countries were conducted either in the currency of the country to which the goods were exported or on the basis of United States currency and the invoices converted into the foreign currency, either at the current rate of the day on which the draft was made or at a rate fixed by agreement between the buyer and the seller.

In business with India, Egypt or other countries where the currency of the country drawn on did not have a free and ready market in this country, some standard currency was used, such as pounds sterling, French francs, United States dollar or German reichsmark, and with each country some particular custom was (and is at the present in some cases) in vogue.

For instance, business with China is conducted in such a way that a bank in the Far East notifies its correspondent in the United States to buy bills drawn on certain firms in China (who have made credit arrangement with them) by a firm in the United States paying the face amount of the draft to the drawer here in United States currency and, by placing on the face of the draft what is known as the Far Eastern clause, collects from the drawee all interest and bank charges. The bank in the East does not in all cases release the drawer until the bill is actually paid, but even this method provides a system whereby the American exporter is financed, inasmuch as he receives his funds at once and can use them but has on his books a certain credit risk.

In Australia and New Zealand it has been customary for years for the drawee to pay all charges, and under such circumstances a bank in the United States is able to buy bills on Australia drawn in sterling, no matter for what time the draft has to run, on the same basis as it would buy a sight draft drawn on London.

All South American business in the past was done on the basis of pounds sterling.

#### A Risk in Exchange

In dealing in foreign currencies the exporter at home always has to take a risk in exchange, and, where the margin of profit was sufficient, it was not a source of worry because exchange on the principal foreign countries would fluctuate more or less within a range of 2 per cent and could not fluctuate much more for the reason that gold would be imported or exported, thus sending the exchange rate back to normal. Where the margin of profit was very slight, the exporter sold exchange in advance against his prospect shipment, thus clinching his profit. This is particularly true of the grain and cotton trade.

To-day things are different: Trade is conducted to an enor-

mous extent in United States dollars in places throughout the world where other currencies have been used before. This is due, first to the fluctuating values of the European currencies, and, second, to the fact that New York is the cheaper money market in which to borrow and now enjoys the same privilege of financing by time drafts on banks under the Federal Reserve Law as Europe has had for years.

The part that the banks and bankers in the United States take in financing exports is, in purport, as follows:

They buy from responsible firms and manufacturers in the United States drafts drawn on foreign countries. If drawn in a foreign currency, they buy the drafts at the current rate of exchange prevailing on the day the bill is offered and sometimes will quote in advance prices at which they will buy for future delivery. (Under present conditions where some of the currencies fluctuate 2 or 3 per cent over night this is no longer the case, as such fluctuation is 64 to 96 times greater than in normal times when a variation over night of 1/32 per cent is the rule.)

They buy bills drawn in United States currency on foreign countries, charging interest from the time they pay out funds in New York till they receive returns, generally fixing a certain time for the voyage to and from the foreign country based on average instead of figuring actual number of days.

#### Interest and Commission Charged

In addition to interest, they charge a commission for handling the bill from  $\frac{1}{8}$  per cent up, depending on what the foreign correspondent charges and the foreign bill stamp whatever it may be. In Europe it is generally 1/20 per cent, and the highest cost is Brazil with 1/20 per cent.

Interest, commission and bill stamps are all figured down to a net rate (such as 1 per cent for a sight bill on Buenos Aires), thus obviating the necessity of calculating each item separately.

When all charges are to be paid by the drawee, a notation to this effect is placed on the draft and the exporter gets the face amount of his draft without any deductions, although this is a bad practice, as many drawees refuse to pay amounts added to drafts or claimed from them by collecting banks. It is better to add all charges to invoice and draw the draft for the total amount of the merchandise, plus bank charges.

As I explained before, where custom has fixed that the drawee pays all charges, the case is different.

#### Bank Extends Credit on Drafts

In buying drafts of all kinds the bank is extending credit or making a loan to the seller of the bill and does not take into account the standing of the drawee, except under certain circumstances. Where a bill is drawn on a commercial firm in a foreign place, the bank considers the seller of the bill as the credit risk for the entire life of the bill; but where the bill is drawn on an A1 foreign bank, the bank may, at its discretion, re-open the line of credit granted to the drawer after the acceptance of the bill. This is the practice, although, should the bill not be paid at maturity for any reason, the drawer will have to make good.

Under the provisions of the new bank laws, banks may accept bills drawn on them at long time against the exportation of merchandise. This is an ideal method of financing export business, which has as yet been little availed of (most of the acceptances so far in existence are against importation of merchandise) and is accomplished by having the exporter arrange with the bank a line of credit which will give him the privilege of drawing on the bank a time draft against his exportation, either by passing through the bank his actual foreign items or supplying it with full details of the foreign transaction, a part of which details appears on the draft drawn on the bank in order to determine that it is

drawn against actual exports. When the bank accepts the bill the holder may discount it in the open market at the best rate and is borrowing money at the rate at which he discounts the bill plus the commission he pays to the bank.

This system, to my mind, has been the strongest feature of Europe's ability to finance to the greatest advantage.

The fact that banks may accept time bills drawn on them is also of great advantage to the exporter who, while willing to give time, wants a good credit risk with it. Instead of demanding from his foreign customer that he arrange to pay cash through a New York bank against documents, he can, with perfect safety, let his customer open a credit in New York whereby he will be enabled to get a good acceptance in return for his documents.

This makes the buyer in the foreign country go to his own bank in order to open the credit in New York and his own bank takes the credit risk, but it gives him time, which is what he wants. Of course, he must pay his own bank a commission, but he does that quite naturally if he cannot get better terms.

Outside of credits opened in favor of the exporter through a bank and goods sold through some firm which will take the credit risk on the foreign buyer, all business must be done by the seller taking a credit risk.

At the present time in the automobile industry, your terms are met by the foreign buyer and he is paying you cash be-

cause he must. When conditions alter it remains to be seen just what changes will take place—competition will no doubt decide in due time.

To some exporters the ideal situation is one where, on the knowledge it may have of a foreign firm, a bank in the United States will buy the exporter's drafts and release him from further obligation. It has been said that this has been done in Europe. It is true that this custom has been practised to a certain extent by one or two banks in a foreign country, but it cannot be a success, as it removes without just compensation the risk that has always existed and will continue to exist between the two parties to a trade—the buyer and the seller. In these days of modern business we may solve it for the benefit of the American exporter, but I don't see why he should be subsidized to that extent.

The part that American banks established abroad play in financing is not different in many ways from banks already established on the ground, except that they give the American exporter, in connection with United States Government officials, intelligent assistance in its trade with the United States and are always ready to take a credit risk on good native concerns to help them finance their purchases in the United States. They protect the value of the United States dollar in international exchanges and stand ready to assist the American exporter to the utmost when consistent with sound banking principles. They cannot do more.

## Saxon Production Only Slightly Delayed by Fire

**A**DAPTABILITY and rapid organizing effectiveness were emphasized as assets of the Saxon Motor Car Corp. by the recent fire at the plant of the company in Detroit. Although the main building was partially destroyed on Saturday morning, Feb. 3, in a week from the following Monday, not only was the office force installed in a newly-leased office building, but also equipment had been installed in a plant  $\frac{1}{4}$  mile long, which was under lease and cars were being built.

Owing to the fact that the building which was burned was entirely used for assembly, the company had a large supply

of material, including engines, axles, springs, bodies, frames, fenders, radiators, etc., stored in other buildings so that these units were available for immediate manufacture of cars. The company expects to complete all shipments to dealers on schedule time.

The service department was not touched by the fire and the work of replacing parts, etc., for Saxon car owners was able to continue without interruption.

Damage due to the fire is estimated at \$1,250,000, all covered by insurance. The company was protected not only against property loss, but also against loss of profits during any time that the fire prevented or curtailed its shipments of cars.

The present manufacturing quarters have greater floorspace than the damaged building.



Interior and exterior of temporary factory of the Saxon Motor Car Corp., in which cars were being built a week after fire partially destroyed the company's assembly building



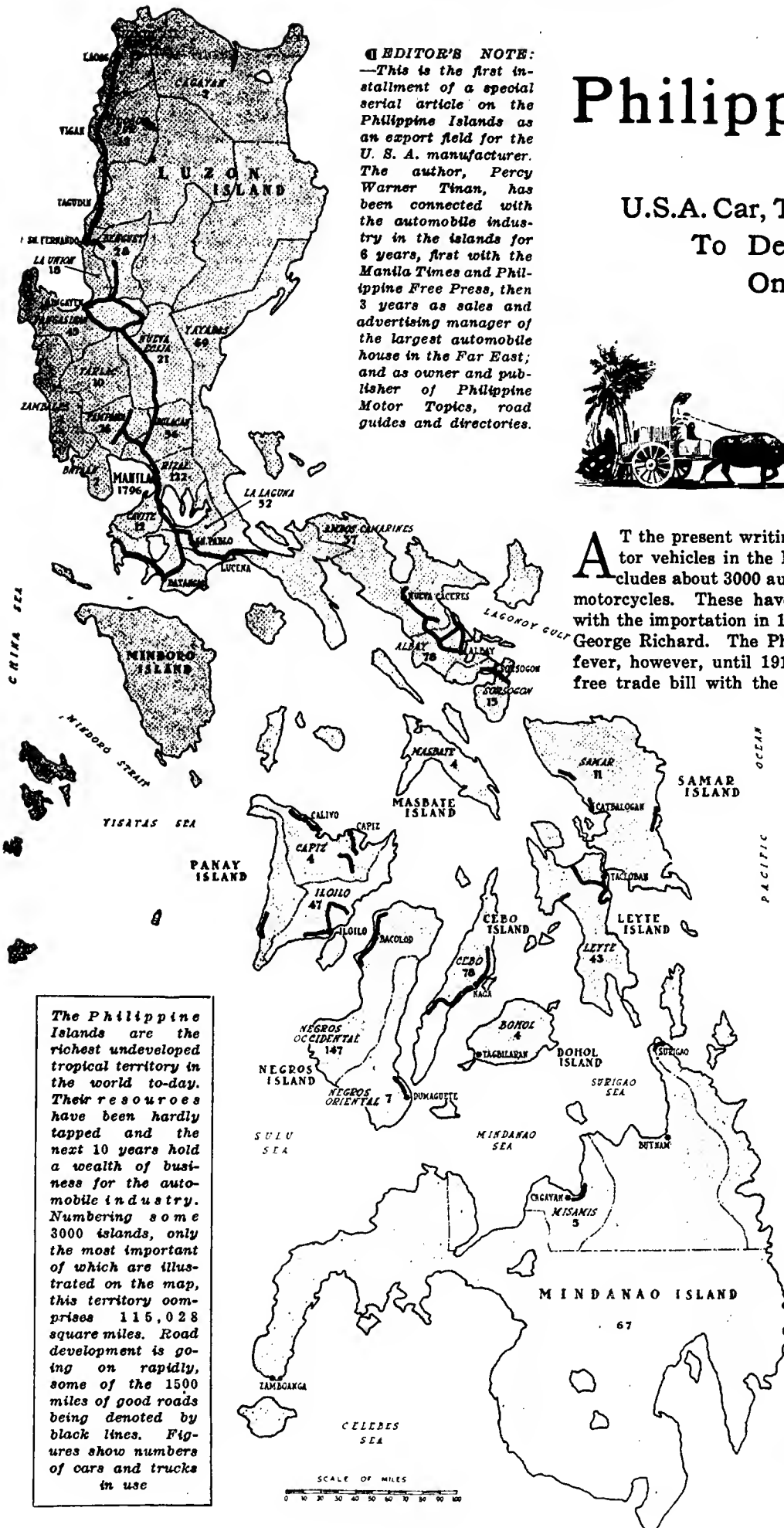
# Philippine Islands

## U.S.A. Car, Truck and Accessory Manufacturer To Develop Permanent Trade in Only 5000 Motor Vehicles Now

By Percy Warner Tinan



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The Philippine Islands are the richest undeveloped tropical territory in the world to-day. Their resources have been hardly tapped and the next 10 years hold a wealth of business for the automobile industry. Numbering some 3000 islands, only the most important of which are illustrated on the map, this territory comprises 115,028 square miles. Road development is going on rapidly, some of the 1500 miles of good roads being denoted by black lines. Figures show numbers of cars and trucks in use

**A**T the present writing there are approximately 5000 motor vehicles in the Philippine Islands. This number includes about 3000 automobiles, 500 motor trucks and 1100 motorcycles. These have been sold over a period beginning with the importation in 1901 of a little "one-lung" belt-driven George Richard. The Philippines did not get the automobile fever, however, until 1910, shortly after the passage of the free trade bill with the United States which meant the

removal of the duty on American cars. They had previously paid 20 per cent, the same duty as levied on European cars.

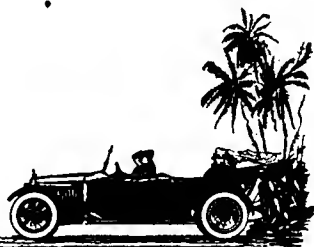
In 1910 there were about 300 cars in the islands, nearly all of them in Manila, and with the exception of four Wintons, two Thomas Flyers, a Maxwell, a Chalmers and a dozen Fords, Manila boasted of a fine assortment of French cars—mostly Renaults, Brasiers and Delahayes selling at \$3,000 up. These cars had all been sold with no road mileage whatever aside from one 25-mile trip outside the city. Road work was going on, however, and, coincident with the passage of the free trade bill, came a more general road-building campaign under the administration of Governor General Forbes. One connection followed another on the provincial road systems and with good American cars at prices previously unheard of in the islands the wealthy and middle-class Filipinos, mestizos—half castes—and Spaniards began to forsake the caromatta, calesa (two-wheeled vehicles) and victoria for more modern transportation.

A thousand miles of isle-strewn sea lying about 650 miles southeast of Hongkong constitute the Philippines. Of the

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urers Should Seize Present Opportunity  
 One of Richest Regions of Orient—  
 Use by 8,000,000 Population

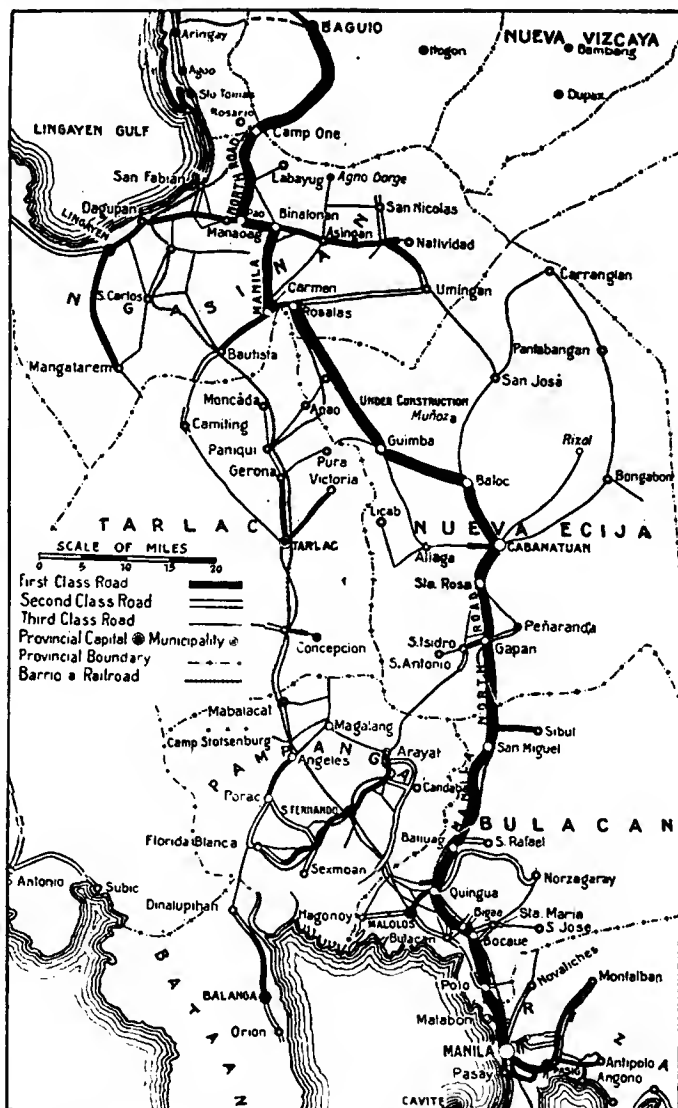
## Part I



3000 or more islands, Luzon, about the size of the State of Ohio, Panay, Cebu and Negros, somewhat smaller, and Mindanao, about the size of Luzon, are inhabited by the great majority of the total population of 8,000,000, and, in the order named, offer the principal field for the automobile manufacturer. Of this population of 8,000,000, about 1,000,000 belong to the non-Christian tribes and cannot in any way be considered as a buying population, aside from such isolated instances as the Sultan of Sulu and his court, and some of the wealthy chieftains and head men who make their homes in the cities. Of the remaining 7,000,000, 50,000 are American, European or half caste, who may be considered a potential buying factor. There is also a Chinese population of about 40,000, among whom are many wealthy Chinese who have just started to buy cars. The American population of the islands is about 6500, exclusive of the army and navy, but owing to the short tours of duty of army officers the 15,000 troops and officers do not count for much as buyers. Sales of cars to army officers will not run over fifty cars per year. The Spanish population is doubtful, as is the exact or approximate number of mestizos. The English, German, French and other European colonies, exclusive of Spanish, will probably total 10,000, and constitute a very potential buying factor as most of them are engaged in profitable commercial enterprises.

### Filipinos the Real Car Buyers

During the past 3 years of democratic administration there has been a gradual decrease of Americans in the government service and while the American community has never been a big buyer of cars it is growing steadily smaller, and with the steady increase in the number of Filipinos acquiring government positions, dealers may look for a good increase in car sales inasmuch as a native will buy a car on about one-



Detail road map, showing the principal automobile roads in the vicinity of Manila. There are 1500 miles of good roads in the Philippines and some of the best are near Manila

half the salary earned by an American. American standards of living are high and automobile operation in the islands is expensive, especially in the case of the average American who feels that it is beneath his dignity to operate a car and turns it over to a native chauffeur who proceeds to run up repair bills, not to mention joy rides and pilfered gasoline. It is nothing uncommon to hear an American complaining of outrageous gasoline consumption and a tire mileage of only 2500 or 3000 miles, usually due to an incompetent and worthless chauffeur.

A glance at a directory of car owners of the Philippines will quickly show who the car buyers are and in this connection it might be said that accurate registration records are kept

### DISTRIBUTION OF CARS, TRUCKS AND MOTORCYCLES IN PHILIPPINE ISLANDS SEPT. 1, 1915

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Albay	59	19	29	107	Leyte	17	26	21	64
Amb. Camarines	22	15	23	60	Manila (City)	1522	274	475	2271
Antique	..	..	4	4	Maspato	2	2	..	4
Bataan	2	..	7	9	Mindanao	48	18	23	90
Batangas	..	..	23	45	Misamis	4	1	3	8
Benguet	24	4	8	33	Nueva Ecija	14	7	7	21
Bohol	4	..	5	9	Occidental Negros	144	3	41	188
Bulacan	56	..	32	89	Oriental Negros	5	2	12	19
Cagayan	..	2	2	4	Pampanga	26	..	26	32
Cavite	11	1	21	33	Pangasinan	39	6	40	85
Capiz	4	..	14	18	Rizal	114	8	53	175
Cebu	70	8	35	113	Samar	7	4	6	17
Ilocos Norte	8	4	..	22	Sorsogon	10	5	4	19
Ilocos Sud	8	4	33	155	Tarlac	7	3	6	16
Iloilo	35	12	15	62	Tayabas	66	3	5	74
Isabelle	..	..	1	1	Zambales	1	..	1	2
La Laguna	37	15	15	67					
La Union	16	2	4	22					
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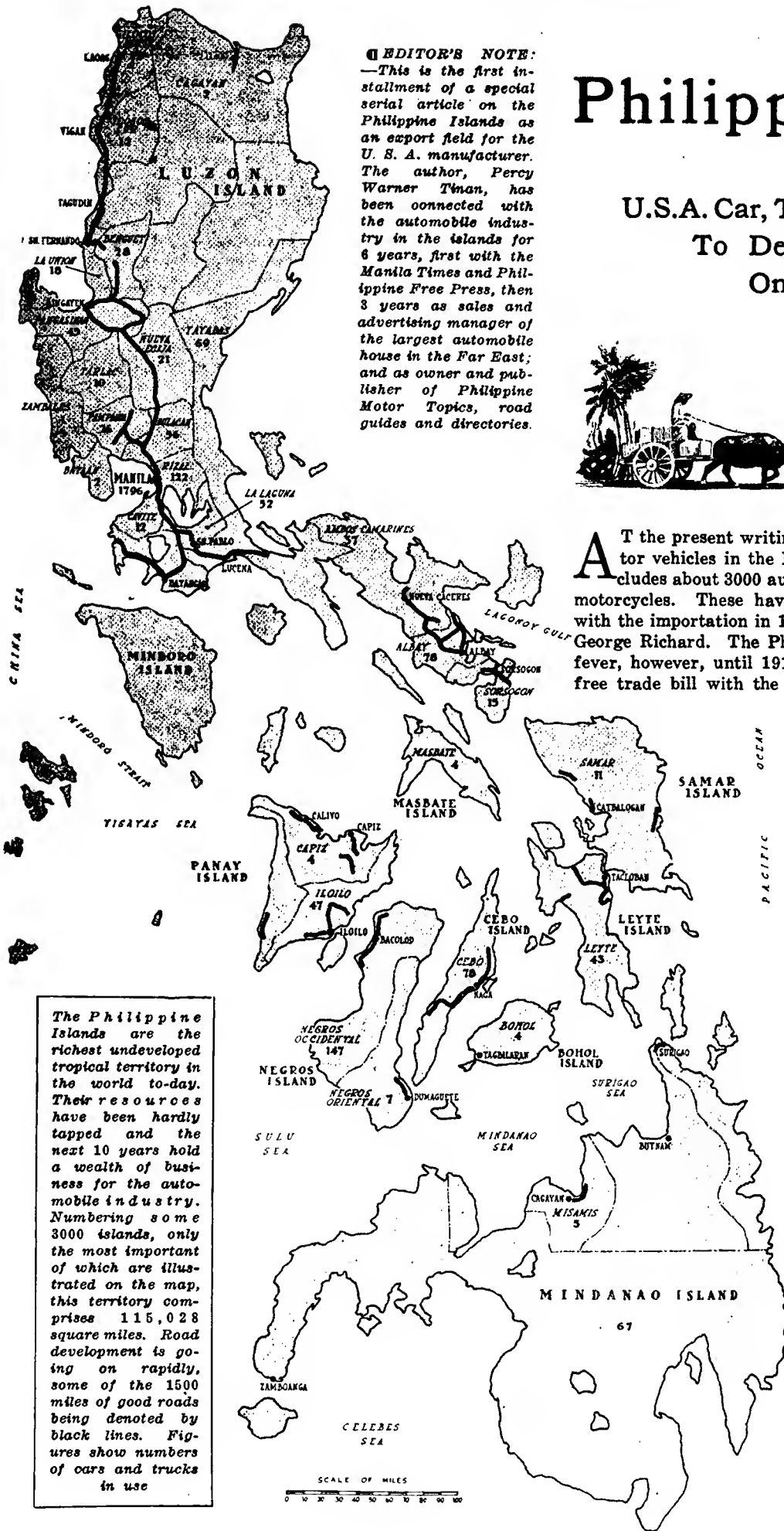
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At the present writing there are approximately 5000 motor vehicles in the Philippine Islands. This number includes about 3000 automobiles, 500 motor trucks and 1100 motorcycles. These have been sold over a period beginning with the importation in 1901 of a little "one-lung" belt-driven George Richard. The Philippines did not get the automobile fever, however, until 1910, shortly after the passage of the free trade bill with the United States which meant the removal of the duty on American cars. They had previously paid 20 per cent, the same duty as levied on European cars.

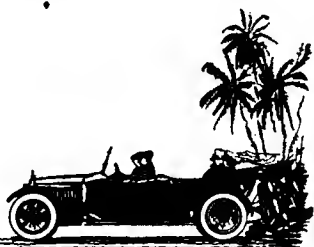
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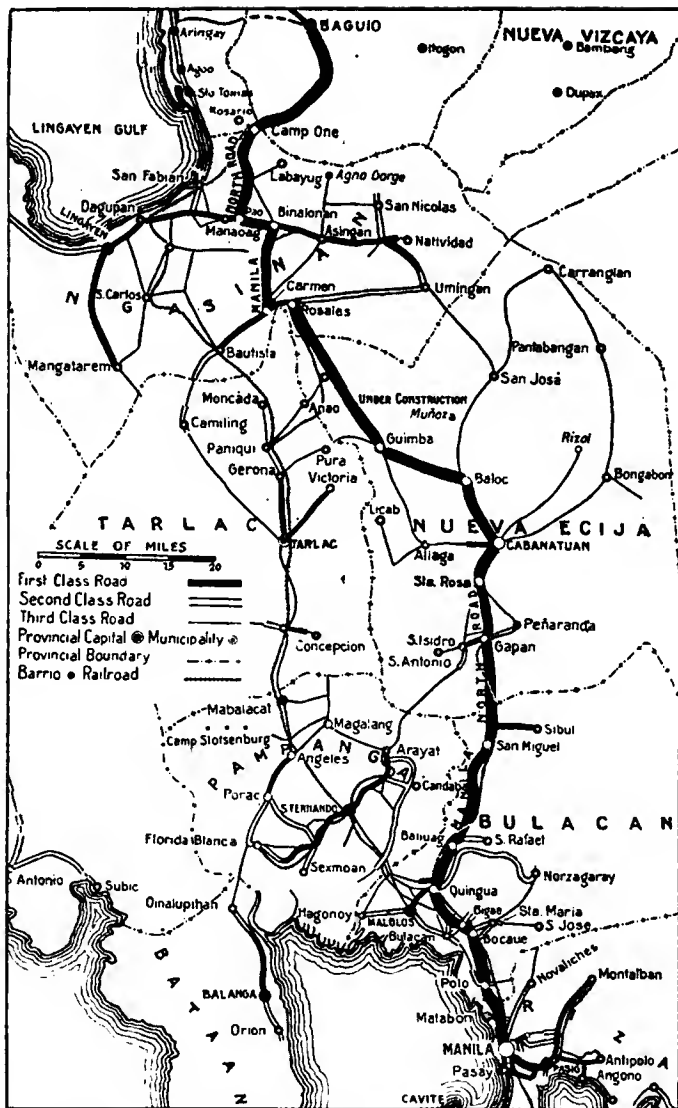
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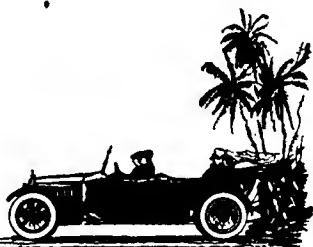
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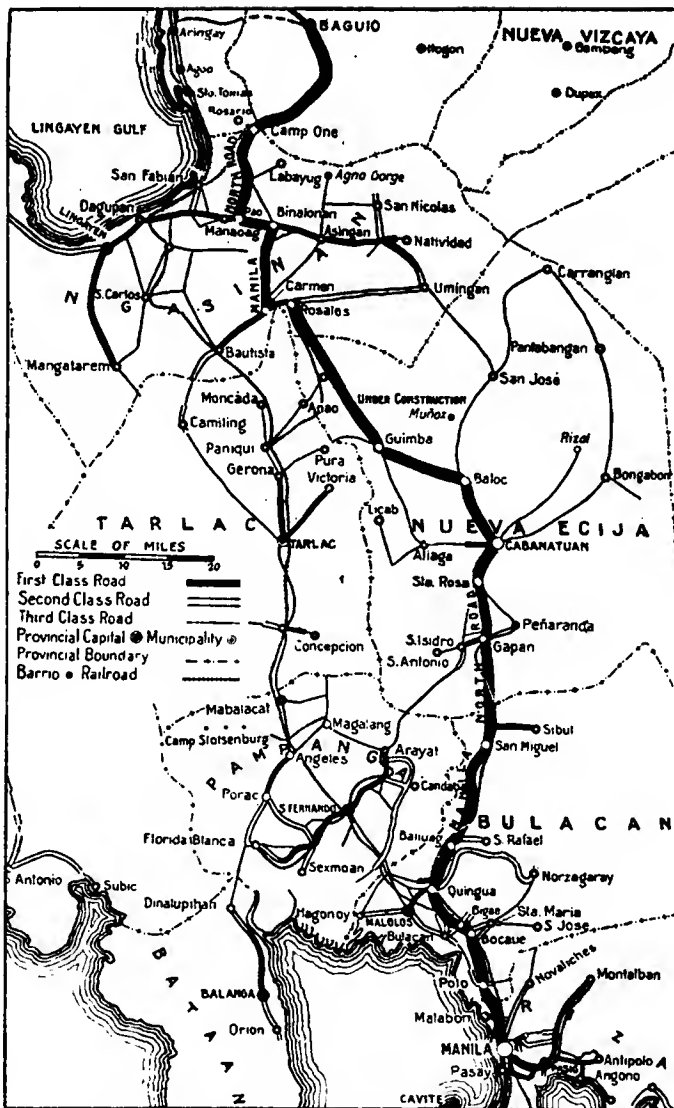
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Amb. Camarines	22	15	23	60
Antique	..	..	4	4
Bataan	2	..	7	9
Batangas	..	..	23	45
Benguet	24	4	8	33
Bohol	4	..	5	9
Bulacan	56	..	32	89
Cagayan	..	2	2	4
Cavite	11	1	21	33
Capiz	4	..	14	18
Cebu	70	8	35	113
Ilocos Norte	8	4	..	22
Ilocos Sud	8	4	33	155
Iloilo	35	12	15	62
Isabelle	..	..	1	1
La Laguna	27	15	15	67
La Union	16	2	4	22

Location	Touring	Trucks	Motorcycles	Total
Leyte	17	26	21	64
Manila (City)	1522	274	475	2271
Masbato	2	2	..	4
Mindanao	49	18	23	90
Misamis	4	1	3	8
Nueva Ecija	14	7	7	21
Occidental Negros	144	3	41	188
Oriental Negros	5	2	12	19
Pampanga	26	..	26	52
Pangasinan	39	6	40	85
Rizal	114	8	53	175
Samar	7	4	6	17
Sorsogon	10	5	4	19
Tarlac	7	3	6	16
Tayabas	66	3	5	74
Zambales	1	..	1	2
Total	2512	439	1004	3955

# Philippine Islands

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By Percy Warner Tinan



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The Philippine Islands are the richest undeveloped tropical territory in the world to-day. Their resources have been hardly tapped and the next 10 years hold a wealth of business for the automobile industry. Numbering some 3000 islands, only the most important of which are illustrated on the map, this territory comprises 115,028 square miles. Road development is going on rapidly, some of the 1500 miles of good roads being denoted by black lines. Figures show numbers of cars and trucks in use

At the present writing there are approximately 5000 motor vehicles in the Philippine Islands. This number includes about 3000 automobiles, 500 motor trucks and 1100 motorcycles. These have been sold over a period beginning with the importation in 1901 of a little "one-lung" belt-driven George Richard. The Philippines did not get the automobile fever, however, until 1910, shortly after the passage of the free trade bill with the United States which meant the

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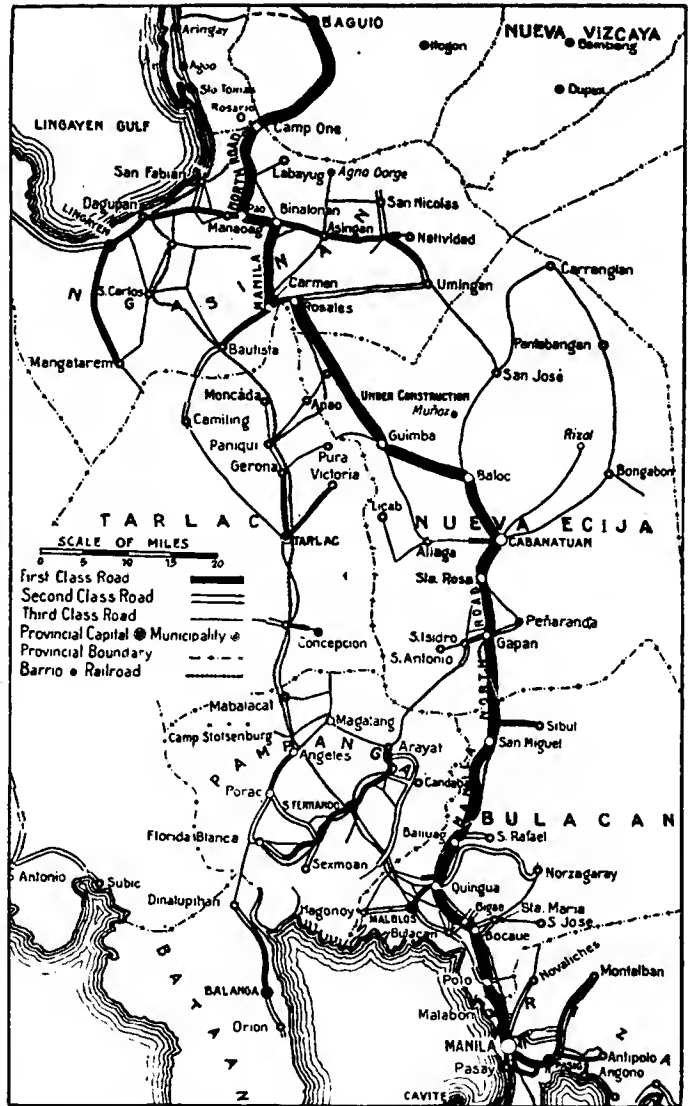
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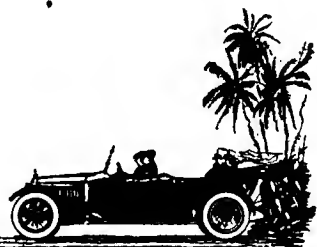
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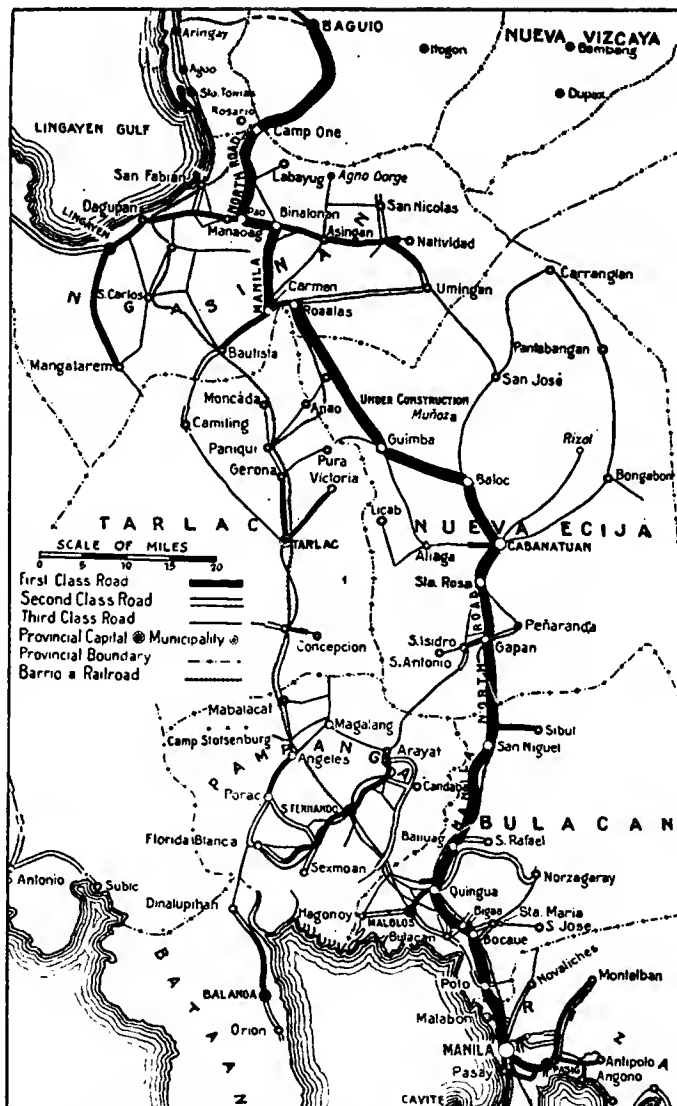
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At the left is a typical cart drawn by a carabao or native buffalo. This vehicle is the chief means of transportation in the Philippines and is only beginning to make way for the motor vehicle

Below — World-touring Hupmobile passing a rice cart on the plains of Nueva Ecija in 1911. During January, February and March 600 of these rice carts arrive in Cabanatuan daily each with a ton or more of rice. There are only two trucks in this province hauling rice

of all cars sold and complete figures may be obtained upon application to THE AUTOMOBILE.

The native Filipino people and the mestizos are the car buyers, present and future, and the instances have not been few where the writer has witnessed a "Pobre," or poor-looking Filipino, wearing his shirt-tail outside his trousers, "costumbre del pais," reach down into his cotton breeches, little more than pajama trousers, and pull out a large roll of bills to make his initial payment on a \$3,500 Renault, Brasier or Panhard, without as much as demountable rim equipment. And this has happened when a completely-equipped American car, at one-third or one-half the price, and of good local reputation has stood alongside the French car. Almost any morning on the Escolta, Manila's main business street, Filipina women attired in very ordinary looking native clothes, chinelas—the Filipino slipper—and smoking big, black cigars or long, fat cigarettes, may be seen alighting from French broughams or limousines or leaning out the windows to call a clerk from a Spanish store who will bring out half the stock for them to look at in the car. The morning dress of the Filipina, Spanish woman or mestizo usually consists of a wrapper that is sometimes so



negligée as to be unsuitable for a shopping tour in America.

These instances are cited merely as examples of the purchasing power of the native who lives in the background of the country's social and business life, city and provincial. They are land owners, house owners and hacienda owners—and they are legion. It should not be inferred from this that the wealthy class of Filipinos all go about in sackcloth and ashes, or hibernate from year to year. Quite on the contrary, they are great dressers, love display, are big buyers of diamonds and jewelry and want the most that they can get for their money in a car, and a night at the Malacanang—Governor's residence—or at an official ball at the Ayuntamiento



Establishment of Manila's oldest and largest dealer. Estrella Auto Palace, a French concern. The salesroom, 80 by 100 ft., is at the right. There are a repair and machine shop, parts and tire stockrooms, etc. This company sells Hudson, Hupmobile, Peerless, Jeffery, Denby, Dodge, Oakland, Scripps-Booth, Fiat and four French makes



*A hairpin turn on the Atimonan road, 100 miles southeast of Manila, crossing the mountain range on the east coast of the island of Luzon. The picture was taken from the highest of three bridges located one above the other. Until recently it was necessary to back on each of these hairpin turns. Grades on this road run as high as 18 per cent. From thick jungle, filled with flowering orchids, at the top of the range the road leads down through solid coconut groves extending as far as the eye can reach to the fishing village of Atimonan, where there is a very fine bathing beach*

will reveal thousands of dollars' worth of diamonds, and wonderful Paris hats and gowns among the mestizos and Spanish women as well as costly dresses of native silk fashioned after the native costumes, among the Filipina women. During almost any night of the Italian opera season, which usually lasts 2 months, the streets about the Manila Grand Opera house are lined for ten or fifteen blocks with everything in the automobile line from a Ford to a six-cylinder Renault limousine.

Manila is, of course, the automobile center of the islands and always will be, owing to its central position, both commercially and as the capital. The increase of cars in the Philippines from year to year will be along the proportion as shown in the accompanying table, with possibly a few exceptions, especially in trucks, which will be taken up later in this article. Manila has a population of 300,000. Tokio, Japan, has a population of 1,500,000. But in neither case can the buying power of these cities be compared with that of American cities of equal size. Manila's buying power from an automobile standpoint can better be determined by classing it with an American city of 75,000. In the opinion of the writer, who is familiar with every detail of the automobile business in the Philippines, Manila will own not less than 10,000 cars and 1000 trucks within the next 5 years.

But the manufacturer or dealer who



*Above is a typical scene on the 115-mile section of the Manila South Road to Atimonan. It is all first class macadam and passes for miles through stately coconut groves. Note the Peerless truck*

*Below—Part of the 30 miles of perfect streets and drives in Baguio, the mountain capital of the Philippines situated in pine-clad mountains 175 miles north of Manila at an altitude of 5000 ft. and near mountains 9000 ft. above sea level. Baguio is reached only by automobile over two remarkably fine mountain roads*

does not extend a forceful sales organization beyond Manila, and few of them do so, is never going to get his share of the business of the islands, nor is the automobile business as a whole going to attain the magnitude which it should.

**Iloilo, a Progressive City**

Thirty-six hours south of Manila by good and frequent steamer connection is the progressive city of Iloilo (E-low-E-low) on the rich island of Panay (Pen-eye), just across a narrow straight from the island of Negros (Nay-gross) the great sugar center of the islands, where increased cultivation and the erection of government sugar centrals bid fair to enormously increase the wealth of the islands. The population of Iloilo is 40,000; of Panay, 743,646; of Negros, 460,000. Manila's largest automobile house has maintained a branch here for some years and has done the bulk of the business in this rich district while other dealers have been asleep on the job. But even this branch is not as progressive as it might be. On both of these islands there are excellent road systems suitable for trucks as well as touring cars, and the former have yet to be introduced to any great extent.

A few hours from Iloilo is Cebu (See-boo) with a population of 60,000 on the island of the same name. The total island population is 592,247. Both of these cities are ports of entry and dealers established there could have their cars shipped on steamers that call either before or after their Manila stop. The island of Cebu has the greatest road mileage of any island except Luzon and the roads are built for the heaviest truck traffic, of concrete and macadam, and like all of the modern roads in the Philippines are the equal of any in the United States or Europe. There are 170 kilometers of first-class roads, 300 kilometers of second-class roads and 139 kilometers of third-class roads, the first two classes being open to truck traffic during the entire year.

A glance at the table will show that there were only twenty-five trucks on these islands on Sept. 1, 1915, and the number has not increased by over 30 per cent since that time. Most of these trucks are in the cities of Iloilo and Cebu and when account is made of the thousands of tons of produce that are annually hauled over the roads by slow and cumbersome carabao carts the field for trucks is easily imagined. About the only reason that no more trucks have been sold in these provinces is because dealers have never properly worked up the business.

Still further south, about 48 hr. from Manila, is the charming little city of Zamboanga, on the island of Mindanao. Zamboanga is not a great market for cars, owing to its limited roads but the big island with its miles and miles of fertile ground that has scarcely been scratched, and its great forest

tracts, is destined for a great future as road development increases, and capital realizes the possibilities of the Philippines as a field for profitable investment.

There will never be a boom in car sales in the Philippines. The growth will be steady for years to come and the manufacturer who establishes himself now will reap handsome dividends in the future.

The following table shows the average weekly car sales in different periods since 1913 in P. I.

	Cars
July 1 to Dec. 31, 1913 .....	8
Jan. 1 " July 1, 1914 .....	12
July 1 " Dec. 31, 1914 .....	13
July 15 " Dec. 15, 1915 .....	10
Dec. 1 " May 31, 1916 .....	16
June 1 " Oct. 15, 1916 .....	18

To go back to the island of Luzon, at the southern extremity, soon to be connected with Manila by first class roads, are the provinces of Albay (Al-by) and Camarines (Kam-are-ee-knees), great hemp producing districts. Both of these provinces already have excellent inter-provincial road systems and by referring to the table again one will note that they showed a total of fifty-two trucks over a year ago. This number has been increased by at least 50 per cent, and the trucks show the result, not of sales organization, but of aggressiveness on the part of two or three Americans who realized the possibilities and "bought" the trucks for passenger and freight



A typical kilometer post on the coast section of the Manila North Road. Hudson car in foreground



Cart bridge formerly at Cabanatuan over which thousands of carts of rice were hauled in harvest time. This type of bridge is strong enough to carry a loaded 3000-lb. touring car. Most of these structures have been supplanted by collapsible deck bridges, the flooring of which is attached to one bank by heavy cables so that when the river rises this floor or deck is lifted off the piles and swung to the shore. When the water subsides replacement is easy



A typical bamboo ferry. Many have disappeared of late years but there are some still left. The carrying capacity of bamboo is very great. For example, the world-touring Hupmobile the first car to make the 175-mile trip from Manila to Baglio, crossed here on a raft of thirty 4-in. bamboo poles

GOVERNMENT STATISTICS OF CARS LEADING IN PHILIPPINES AND THEIR YEARLY INCREASES UP TO DEC. 15, 1916

Car	Feb. 15, 1913	Feb. 5, 1914	Feb. 24, 1915	June 30, 1915	Dec. 10, 1915
Hupmobile	109	268	421	488	521
Ford	80	133	212	247	301
Overland	66	107	192	228	283
Buick	90	136	188	215	239
Hudson	69	84	114	121	129
Brasler	95	106	120	120	123
White	31	71	101	108	118
Studebaker	5	48	74	97	108
Chalmers	51	81	89	89	89
Renault	61	73	86	87	91
Reo	33	49	61	71	73
Delahaye	25	49	68	70	70
Gen. Vehicle (E)	26	55	55	61	61
Gramm	17	47	57	58	58
Cadillac	20	36	43	53	61
Dodge	...	..	..	6	48

Owing to a new registration law which went into effect April 1, 1916, and its slack enforcement, accurate figures of the new totals for Jan. 1, 1917, are hard to obtain, but the increase among the leading cars has been decidedly marked—in Buick, Overland and Studebaker, while Dodge jumped into fifth place with a total running over 200. Altogether there are over 135 different makes of automobiles and trucks in use in the Philippines, many of them represented by one car only. The Philippines have yet to see a Pierce-Arrow, Locomobile, Simplex, Rolis-Royce, Mercedes, Isotta-Fraschini or some of the newer American low-priced cars.

6 to 18 miles. Eighty per cent of this is taken to the depot carabao carts drawn by one or two carabao, each carrying 1 ton. While this situation is in a measure the fault of local dealers, another important factor enters in that while there are miles of road to withstand almost any truck there has been a scarcity of bridges strong enough to carry even a loaded 1-ton truck. Bridging the larger Philippine rivers is expensive but bridges will come in time and that time is very near with respect to these two provinces.

Fine Roads in Northern Luzon

Still farther north on Luzon, on the northwest coast, are the provinces of La Union, Ilocos (E-low-kus), Sur and Ilocos Norte (Nort-tay), which show but ten trucks on the table, the number probably double that at present. With white coral roads "taken care of with a fine tooth comb and manicure scissors"—according to the description given by a famous American tourist who has seen the world's finest roads—these provinces beyond the end of the Manila railroad offer great possibilities for both trucks and more touring cars as soon as bridges are in and traffic thus kept open throughout the rainy season.

So much for the possibilities of car sales, but in closing this subject it might be said that as late as 6 years ago the writer was told by several leading commercial houses in Manila, whom he attempted to interest in trucks, that the motor truck could never compete with the carabao, the native work animal which has done the hauling for the Philippines for 300 years. Manila's 300-odd motor trucks and about 250 more at work in the provinces to-day are a decided refutation of that argument, and the purchase of trucks in Manila by old-time Spanish concerns, who are always the last to adopt any change so radical, presage the inevitable: the doom of the carabao as a transportation factor and his return to the soil to do more plowing and cultivation for a country that to-day depends upon him for rice cultivation and yet does not raise enough of this, its main article of diet, to feed itself, but must needs import from Indo-China. And the time is coming when the hundreds of these animals now in use in cities will not be permitted on the streets. Then, indeed, will the truck salesman have a feast.

( To be continued )

business. The trucks were not "sold." The American's example was followed by two other Filipino organizations.

On the island of Leyte, see table, there is another hustling American organization which also "bought" trucks and has worked up a great freight and passenger business. These companies show the possibilities in other districts if the man at the head of some sales organization will go out and analyze the situation instead of waiting until someone comes around to buy his goods.

Between the province of Camarines and Manila are the provinces of Tayabas (Tie-ah-bas) and Laguna (La-goo-na) which produce about 50,000 tons of copra (kô-pra), the meat of the cocoanut, annually, and boast about twenty trucks some of these owned by the government. But of greater moment even than this astonishing situation are the two great rice-producing provinces of Nueva Ecija (A-see-ah) and Pangasinan (Pan-gas-ee-nan), north of Manila, where most of the 52,000,000 bushels of rice produced by the islands are moved annually and not over four trucks are engaged in the work. The average haul from the hacienda to the depot is

# Complete Cork Clutch Facing Possible

Laboratory and Road Tests Indicate That Disks and Sheets of Special Composition May Be Used—Indiana S. A. E. Hears Paper on Cork

INDIANAPOLIS, IND., Feb. 16.—Complete clutch facings of cork for both disk and cone clutches, instead of employing the cork simply as inserts, is now a possibility. Laboratory and road tests indicate that special compositions of cork in the form of disks and sheets may be made to replace leather and fabricated clutch facings, and improving the operation of the clutch.

This announcement was made by Engineer Young of the Armstrong Cork Co. during the discussion of a paper on the production of cork and manufacture of cork products delivered last night before the Indiana Section of the Society of Automotive Engineers, by H. W. Prentice, Jr., manager of the publicity department of the Armstrong company. The manufacture of cork clutch inserts, carbureter floats, gaskets, etc., was explained and illustrated by slides and the making of linoleum such as used

for running boards was shown by moving pictures.

The real feature of the meeting was the announcement of cork clutch facings. Mr. Young stated that these have been under test for several months and so far have not shown signs of failure. He said that though the coefficient of friction of cork varied greatly with its grade and treatment, it was so much greater than common friction materials that it permitted the transmission without slippage of great power and at the same time produced a clutch that was very soft in action.

One interesting feature brought to light by their experiments is the fact that in using the cork sheet as a lining for a cone clutch, it is necessary to increase the angle of the cone from the usual 12 deg. to about 16 deg. Otherwise, the clutch would refuse to release. Extracts from Mr. Prentice's paper appear below.

## History of Cork—From Tree to User

By H. W. Prentice, Jr.  
*Armstrong Cork Co.*

CORK is the outer bark of the cork oak, a tree which flourishes in the Spanish Peninsula, Southern France, Italy and Northern Africa. Of the various countries, Portugal is the leader in cork production. Spain is a close second and Algeria ranks third.

The heavy coating of outer bark is removed every 8 or 9 years. So long as the delicate inner skin is not harmed, this process seems to further rather than retard the growth of the tree. The process is simple. They cut through the outer bark carefully, following the deepest of the natural indentations, and then pry it off in large sections by inserting the long wedge-shaped handles of their hatchets.

Not only the trunks but the larger branches are stripped, the latter yielding the better bark. Care must be taken not to injure the inner skin of the tree at any stage of this process, for the life of the tree depends on its proper preservation; and if it is injured at any point, growth there ceases and the spot remains forever after scarred and uncovered.

### Strip 5-in. Trees

The trees are stripped, as a rule, for the first time when they have attained a diameter of about 5 in., which they usually do by the time they are 25 years old. The first stripping is known as virgin cork. It is so rough and coarse in texture that it is of comparatively little commercial value. The tree at once sets about forming a new coating which, at the expiration of 8 or 10 years, is also removed. It is known as second stripping bark, a piece being shown on the right of this picture. As a rule the second stripping cork is of fair quality, but owing to the large number of indentations, there is a great deal of waste involved in cutting it up.

But with the third stripping of bark, which follows in about

9 years, the tree begins to yield its best bark, continuing productive, as a rule, for a century or more. Cork trees several hundreds years old, however, are not unknown.

After the bark is removed from the tree it is gathered in piles in the forest and allowed to season for a few days. The thickness of the bark is anywhere from  $\frac{1}{2}$  to  $2\frac{1}{2}$  in., while the yield also varies greatly—from 50 to 500 lb., depending on the size and age of the tree. The bark is next roughly baled up and carried, either on the backs of burros or in wagons, to the nearest boiling station. Here it is boiled in large vats to render it soft and pliable and to flatten it out for convenient packing. After boiling the rough, woody part can be easily scraped off, reducing the weight of the material almost 20 per cent.

Loaded on the backs of burros, or sometimes in wagons, if the roads are good, the cork is then carried to the nearest railway station for transportation to the cork manufacturing and distributing centers. The long trains of burros—thirty, forty or even 100—present a most grotesque appearance, each animal loaded from head to hindquarters with a huge mass of the light bark.

### Grading Is Important

Arrived at the factory, the cork first goes to the trimmers, who cut off the rough, undesirable portions. It is then sorted into a dozen or more grades, according to quality and thickness. The importance of this last mentioned operation cannot be over-emphasized, as the whole problem of the successful and economical manufacture of cork centers about it.

When the cork is re-baled for shipment to America, broad sheets are laid in the baling box to form the bottom of the bale. Above them are placed smaller pieces, which in turn

are covered with larger sections. The whole mass is then subjected to pressure to render it compact, afterward being bound up securely with steel hoops or wire. The average bale weighs 200 lb.

For whatever purpose it is to be used, all bark removed from the immense storage rooms of the American plants is taken first to the sorting department, where, under skilled eyes, the twenty-five or more foreign grades are re-sorted into approximately 150 different classes, according to quality and thickness.

**Cutting Corkwood Into Sheets**

The corkwood is then softened by placing it in a warm vapor bath. Then by means of a circular steel knife, making hundreds of revolutions every minute and kept at razorlike sharpness the sheets are cut into strips whose width is determined by the length of the cork desired.

From the slicer the strips pass to the blocking machines, where by the operation of a rapidly rotating tubular punch, cylindrical pieces are bored out and released with almost incredible speed.

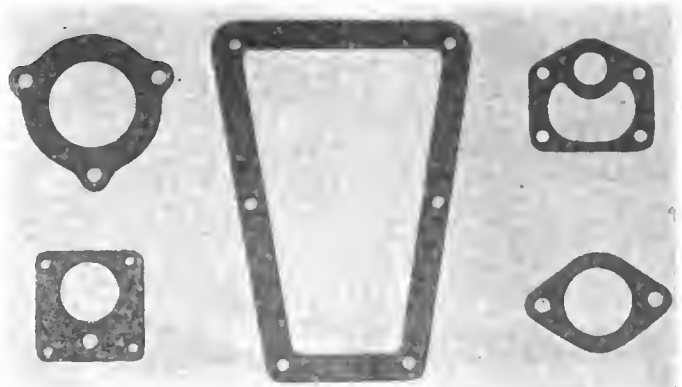
The stoppers which come from these machines are round, with parallel sides. If tapered corks are desired, larger at the upper end than at the bottom, the cylindrical or straight pieces must be passed through other machines.

A host of other useful articles also find their way from the many manufacturing departments to the shipping-room. Of insoles from 15,000 to 20,000 pairs are produced daily. Disks and washers by the million are punched out for use in metal caps for bottles and jars and as gaskets in lubricator cups. Life-preservers, ring buoys, yacht fenders and mooring and anchoring buoys are the specialties of one department. Another pays particular attention to the manufacture of seine and gill corks, and bobbers for fishing lines. So varied, in fact, are the forms which cork assumes, that the complete cataloging of the functions which it fills would be well-nigh impossible. The finest pieces of bark are made into cork paper, so thin that 350 sheets measure but 1 in. in thickness. Sorted into several different grades, this beautiful velvety material is practically all used in making cigarette tips.

**Value of Composition**

While natural cork is used for these purposes extensively, as you will see, experience has shown that a cork composition is much more suitable in many instances. The composition that has been developed at Pittsburgh is the result of several years' effort to produce a satisfactory material for use where the temperature does not exceed 212 deg. Fahr. Gaskets made of this composition are not affected by oil, gasoline, grease or water, and may be kept in contact with any of these liquids without disintegration during service.

Not only is the original elasticity of the cork retained in these gaskets, but the process of manufacture tends to in-



Automobile engine and transmission gaskets made of cork composition

crease it. This characteristic makes them especially suitable for use between rough or uneven surfaces and, hence, where cork gaskets are employed it is not necessary to machine pressed steel parts or castings. As was mentioned before, these gaskets do not harden with age, but remain elastic. This composition is of itself liquid-proof and will not become saturated. It is unnecessary, therefore, to put excessive pressure on the gaskets to insure tight joints. Oil leakage has long been a source of expense and annoyance to the car owner and purchasers are now demanding oil-tight joints. Because of their permanent elasticity and imperviousness to liquids, cork gaskets offer the cheapest efficient solution of this problem, especially where pressed steel pans and covers are used.

**Effective as Rattle Preventer**

The constant resistance of cork gaskets to pressure develops a condition similar to the lock washer in keeping bolts tight. Consequently cars equipped with these gaskets are free from rattling due to loose bolts, so common after a car has been run a few hundred miles.

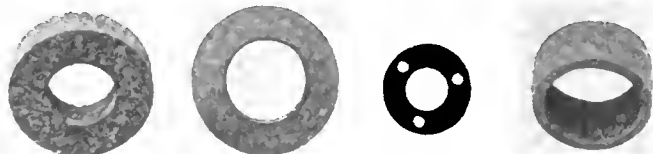
Since smooth surfaces and excessive pressure are not required to secure tight joints with cork composition gaskets, fewer bolts and bolt holes are necessary. This not only increases the strength of the metal parts, but decreases the amount of machine and assembling work necessary. In many cases the saving effected in this way will practically offset the cost of the gaskets.

Cork gaskets have given excellent results between crankcase and oil pan. Such gaskets should ordinarily be thick enough to make a good fill between bolt holes with moderate compression. Added pressure may be applied if desired, as the cork will squeeze to the thickness of thin paper around the bolts. Any spring in the metal will be taken up by the elasticity of the cork, insuring tight joints.

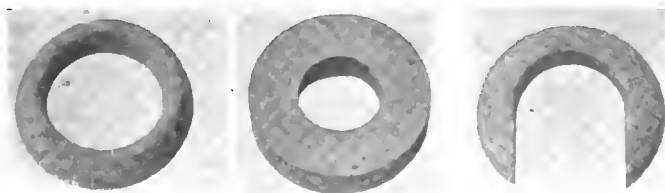
Boiling water or steam, if kept in contact with the flat face of a cork gasket, would, in time, cause damage. If, however, the gaskets are held under pressure between metal surfaces, they may be safely used where the temperature rises to that of boiling water or slightly higher. A number of builders are successfully preventing hot water leakage by using cork gaskets between the top and bottom plates in assembled radiators on motor trucks, and also between pressed steel water outlet and inlet manifolds, baffle plates and motor head stampings. The gaskets readily conform to the irregularities in the castings and pressed steel surfaces, insuring permanently watertight joints.

Many prominent automobile builders have been using gaskets of cork composition in a number of other places. Some of the more general applications are on cover plates for timing gears, valve compartments, transmissions, oil pumps and accessories to crankcase, clutch and flywheel handhole covers, carbureter intake manifolds, differentials, etc.

(Continued on page 431)



Washers and pulley rim cover of cork composition

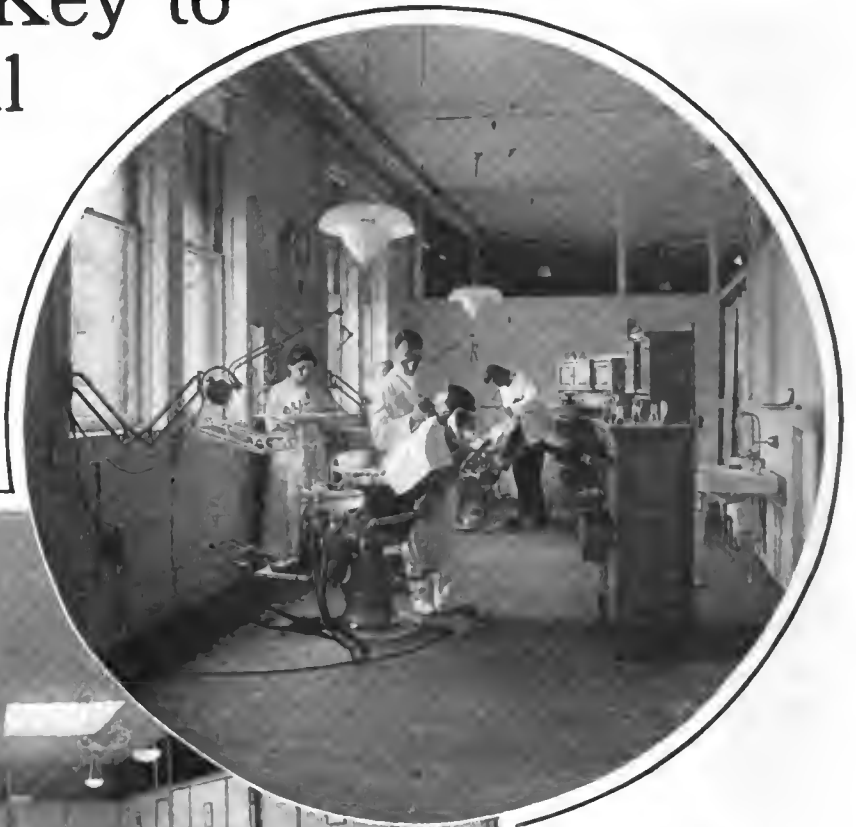


Carbureter, gasoline and oil floats in cork composition

# HEALTH the Key to Better Industrial Relations

A Business Code for Improving Labor

By Allen Sinsheimer



The dental clinic has three operating chairs. It performs temporary relief work for Goodrich employees, in some instances giving full treatment, though co-operation with local dentists is the aim.



A large rest room for office girls is utilized for recreation purposes during lunch hour. There are other rest rooms in various parts of the plant so that the women in each department have similar facilities.

**L**ABOR is the enigma of the industrial world. After successfully contending with the problems of mechanism, capital and like obstacles which confront him, the average large employer inevitably finds himself involved in the question of industrial relations. Sifting it to the bottom, he discovers an astounding labor turnover with its consequent increase of accidents, defects of product and other evils. He attempts to eliminate the trouble with the introduction of welfare, recreation or profit-sharing plans and the result is the almost countless methods adopted, at this time, by concerns throughout the country.

Many of these plans have failed. A few have been successful. None has succeeded where many employers, in the same community, have adopted it and thus again reduced the competition for workers to an equal basis.

Hence, the B. F. Goodrich Co., Akron, seeking a sound and just basis for improved industrial relations, has evolved a new idea: one that embodies many innovations and is yet in the experimental state, but promises many interesting results. It includes many of the well-known features found in the aver-

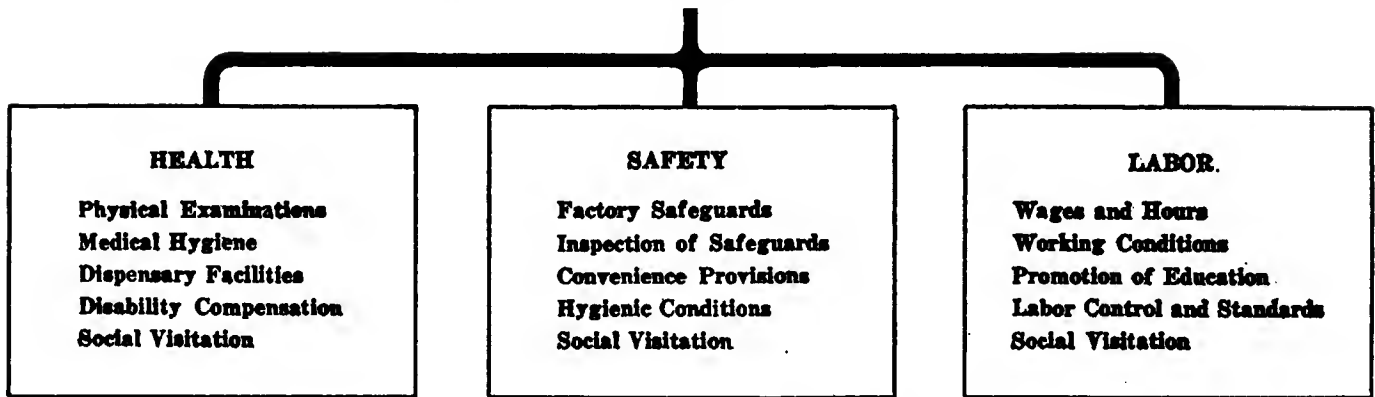
age plan but is constructed on the new principle that workers must be contented, ambitious and cheerful, and that the only employees who may possess those qualities are those who are healthy, bodily and mentally. In consequence, the company has introduced a comprehensive system for the maintenance of physical health among its employees and for the development of interest in their strength and well-being.

The work is administered by the Department of Industrial Relations, coming under the executive direction of the vice-president in charge of operations. The department is composed of three administrative bureaus of health, safety and labor.

1—The department of health is supervised by the health director who is in charge of all medical work done for the benefit of employees and administers the disability compensation. Under his direction come the physical examinations, dispensary work, medical hygiene, and in conjunction with the department of labor, the bureau of social visitation.

2—The department of safety looks after the provisions for and continuous inspection of the safeguards around machinery

Department of Industrial Relations



and arrangements for the physical conveniences of employees and hygienic conditions.

3—The department of labor deals at first hand with the employees on all matters pertaining to hours, wages and conditions of labor. Under its supervision come the employment bureau, the bureau of labor control and standards, the bureau of education, and in conjunction with the department of health, the bureau of social visitation.

The bureaus of labor control and standards attend to the interviewing of employees who have absented themselves from work or are planning to leave the company, the continuous regulation of wage rates, methods of work, advice on legal matters and housing.

The bureau of education is intended to extend a broader elementary education to those employees requiring it, and is also in charge of several bulletins, including the house organ.

A discussion of these departments and their scope and de-

tail necessitates a description of the methods of employment and the experiences of the prospective employee from the time he makes his application to his acceptance.

Requisitions are made upon the employment bureau by the various departments when additional workers are required. Every operation in the plant has been analyzed and classified and the employment manager is, in consequence, able to select new workers with an intelligent appreciation of the work they must do.

All applicants are interviewed, the questioner asking a series of inquiries printed on one of the four pages of the application blank, two pages of which are illustrated herewith. These include name, birth, domestic life, and citizenship. They are then asked for the names of past employers, addresses, length of service, wages, reasons for leaving. They are next instructed to visit the physical examination rooms.

The second page of the application blank contains numerous

**DENTAL CLINIC RECORD**

DENTAL SERVICE IN CLINIC

Date: \_\_\_\_\_

Month Closed - Yes \_\_\_\_\_ No \_\_\_\_\_

Time of Closing \_\_\_\_\_

Checked by \_\_\_\_\_

Time for Examination \_\_\_\_\_

Examined by \_\_\_\_\_

Estimation:  Normal Child and Oxygen  Lead

History of Case \_\_\_\_\_

Other Operations \_\_\_\_\_

Treatment \_\_\_\_\_

X-Ray Diagnosis \_\_\_\_\_

O. K. By Dr. \_\_\_\_\_

**CONDITION OF MOUTH**

Gum Condition—Normal \_\_\_\_\_ Pale \_\_\_\_\_ Inflamed \_\_\_\_\_ Clean—Yes \_\_\_\_\_ No \_\_\_\_\_ Fair \_\_\_\_\_

Brushing Habits—Good Fair Poor Bad. Normal Occlusion—Yes \_\_\_\_\_ No \_\_\_\_\_

Use of brush regularly—Yes \_\_\_\_\_ No \_\_\_\_\_

Use of dentifrice regularly—Yes \_\_\_\_\_ No \_\_\_\_\_

Previous Dental service—Yes \_\_\_\_\_ No \_\_\_\_\_

Number of teeth extracted \_\_\_\_\_

Impactions \_\_\_\_\_

Pyorrhea \_\_\_\_\_

Pain present \_\_\_\_\_

Abcess with abscess \_\_\_\_\_

Abcess—blind \_\_\_\_\_

Other diseased condition \_\_\_\_\_

**DENTAL SERVICE ADVISED**

Cleaning by dentist \_\_\_\_\_

Use of brush and dentifrice \_\_\_\_\_

Fillings indicated \_\_\_\_\_ Oc. \_\_\_\_\_ In L. \_\_\_\_\_ App \_\_\_\_\_

Crowns indicated \_\_\_\_\_

Artificial dentures indicated \_\_\_\_\_

Esthetics indicated \_\_\_\_\_

Bridge work indicated \_\_\_\_\_

Treatment for \_\_\_\_\_

Wearers test advised \_\_\_\_\_

**SUBSEQUENT EXAMINATION** Date: \_\_\_\_\_

Followed advice—Yes \_\_\_\_\_ No \_\_\_\_\_

Improved since last Examination—Yes \_\_\_\_\_ No \_\_\_\_\_

Work done by \_\_\_\_\_

Referred to Dr. \_\_\_\_\_

Given list of dentists \_\_\_\_\_

Call for Subsequent Examination, Date \_\_\_\_\_

Form 200—2-15

**The B. F. Goodrich Company**

Date	Rate	P. R. Number	Occupation	Date	Rate	P. R. Number
1				6		
2				7		
3				8		
4				9		
5				10		

**Employment Bureau Interview**

Name in Full \_\_\_\_\_ Date Born \_\_\_\_\_

City Address \_\_\_\_\_

Home Address, Street \_\_\_\_\_ City \_\_\_\_\_ State \_\_\_\_\_

Where Born? Year \_\_\_\_\_ Date of Emigration \_\_\_\_\_

Married?  Yes  No  In Process  Are You Married?  No

What Languages do you speak? \_\_\_\_\_

What Languages do you read? \_\_\_\_\_

Check whether:  Single  Widowed  Divorced  Living with Husband  Yes  No

If not living with husband, How long separated? \_\_\_\_\_

If married, How many children do you support? \_\_\_\_\_ Give number and ages below.

B. C. 1st B. C. 2nd B. C. 3rd B. C. 4th B. C. 5th B. C. 6th B. C. 7th B. C. 8th

If single, do you support any one?  Yes  No

What job do you expect to do? \_\_\_\_\_ After Learning \_\_\_\_\_

By whom recommended? \_\_\_\_\_

Name of any relative or particular friend in our employ. \_\_\_\_\_

What are you doing to improve yourself? Answer below.

Manually? \_\_\_\_\_

Physically? \_\_\_\_\_

Socially? \_\_\_\_\_

Do you carry a bank? \_\_\_\_\_

Do you carry life ins? \_\_\_\_\_ Use Savings Bank? \_\_\_\_\_

Do you own your home? \_\_\_\_\_

To what Lodges, Orders or Church do you belong? \_\_\_\_\_

How many years—Grammar School \_\_\_\_\_ High School? \_\_\_\_\_ Trade School or Business? \_\_\_\_\_ College? \_\_\_\_\_

What grades did you like best in school? \_\_\_\_\_

What grades did you like least in school? \_\_\_\_\_

What do you like to read? \_\_\_\_\_

**FORMER EMPLOYERS.**

Name	Address	Length of Service	Employed on	Wages	Reason for Leaving

Two pages of the employment blank. The dental clinic record at the left is the last page and the employment bureau interview at the right is the first. The inside of the folder contains a series of detailed questions relative to physical condition





A special model unit stand where workers wash with constantly flowing non-scalding water. It was designed to eliminate the use of the wash basin and its dangers of infection.

questions relative to physical condition, and is forwarded to the examiner to be completed. The examination includes inspection of height, weight, skin, head, eyes, ears, nose, mouth, neck, thorax, lungs, heart, pulse and arteries, abdomen, inguinal region, genitilla, upper extremities, lower extremities, spine, gland and nervous system, following which a diagnosis is made and entered on the sheet.

**25 Per Cent of Rejections Reclaimed**

Whenever a physical defect is found, a full explanation of the conditions and of the proper treatment is given and in event the candidate for employment has no family physician, he is referred to competent practitioners in Akron. Rejections are made only in cases of serious disability, infectious or contagious diseases. Full information is given regarding the best remedial treatment. Approximately 25 per cent of all rejections are successfully treated and later employed.

Page three of the application blank provides for subsequent physical examinations that may be made.

The examination of the teeth is next in order and the records are entered on the last page of the blank. These show by diagram and answers, the condition of the mouth, the dental service advised, the dental service in the clinic, and whatever x-ray and operative treatment has been advised or extended. Space remains for subsequent examinations.

The health department includes eight divisions of administration, statistics, dairy and water examination, physical inspection, dispensaries and laboratories, tuberculosis clinics, dental clinic and social visitation, and comprises a staff of the director, eight physicians, two dentists, twenty-four nurses and a dental assistant. Two of the doctors are women, one in charge of examination of female employees and the other assisting generally in the examination rooms and dispensaries, and supervising the details of disability compensation.

The dental clinic with three operating chairs performs temporary relief work and in some instances renders full treatment but endeavors to cooperate rather than compete with

reputable dentists in private practice. To make instruction in oral hygiene practical, tooth powder selling at 8 cents and brushes at 15 cents are purchased at wholesale by the company and thus retailed to the workers. Three gross of these were sold in December.

Next comes the ear and eye room where examinations are made by tests that do not involve the English language. These are conducted by a specially trained nurse and two clerks.

Complete records of all work are kept and the statistics display many important and interesting facts. Physical examinations have been made of 32,739 applicants for employment. Rejections numbering 5478 or 16 per cent were made by the health department but, as stated, 25 per cent were later employed after their health had improved. The visiting nurses call on

about 250 absentees daily. More than 25,000 examinations of blood pressure were made during the first year but since only eleven displayed weakened conditions by these tests, the examination has been discontinued.

The disability compensation comes under the direction and supervision of the department of health. It is a plan whereby a worker, unable to perform the duties pertaining to his or her occupation, by reason of sickness or on account of injury occurring in any manner not covered by State or National compensation laws, and not occurring or suffered in the course of any work for pecuniary gain other than work for the company, will be accorded disability compensation subject to the rules of the company, provided the company is notified within 24 hr. after the sickness or injury occurs and that the employee has secured the services of a legally qualified physician.

All factory employees who have passed the physical examination in a satisfactory manner are eligible. Compensation is paid provided the disability exceeds 7 days following which the worker is paid for the period of disability including the first 7 days but not exceeding 52 weeks. Single men receive one-half of their average weekly wage earned during

No. 65  
Dec. 1st to 15th, 1916

**SAFETY  
LOYALTY  
CO-OPERATION**

Educational Bulletin  
and  
Record Card

Issued twice a month  
for  
The R. F. Goodrich Co. Employees  
by  
The Department of  
Industrial Relations

In case of INJURY, however slight  
in case of ILLNESS, while working  
in case of TOOTHACHE OR  
MOUTH TROUBLE

Get A Card  
From Your Foreman  
To The Dispensary

**"AUTHORITY"**

**"JAY WALKING" IN A BIG CITY**

AKRON has grown so rapidly that its streets and crossings are not adequate to meet the needs of the people. It used to be that you could walk anywhere you wanted to without concern but now you take your life in your hands every time you cross the street.

So great is traffic congestion that it is literally true that the danger of accident from automobiles and street cars is ever present. To be safe three days, see where you are going and let all where the other fellow is going.

Traffic congestion has made necessary traffic rules and traffic policemen. Even more necessary is traffic sense. At the main crossings always watch the signal.

Laws are not always obeyed therefore protect yourself and look out for moving vehicles when you are getting off a street car.

Never take a "Shut Out". Keep on the pavement to the corner and then cross at right angles.

This care in crossing streets is even more important for your wife and children who are more apt to become confused than you. Take this bulletin home and read it.

Name \_\_\_\_\_

Pay Roll No. \_\_\_\_\_

Day	Rate	No. Days	Daily
Work	Per Hour	Worked	Wages
Mon			
Tue			
Wed			
Thu			
Fri			
Sat			
Sun			
Total			

Copy last totals on next Record Card.

The educational card and bulletin contains safety cautions, inspirational discussions blanks for work records and a page for personal expenses. It is issued every 2 weeks

the 3 months preceding disability, and if proof is established that they are the sole support of dependents the compensation is allowed on the same basis as to married men who receive two-thirds of their average weekly wage, provided they contribute regularly to the support of their families. Widowers supporting children under 16 years of age are classified as married men.

Under the disability plan, female employees receive compensation amounting to two-thirds of their average weekly earnings. Married women, though their employment is not encouraged by the company, are entitled to maternity compensation which is limited to 13 weeks, but may not be paid until after the birth of the child, and is only granted to the married women who have been in the employ of the company for 12 months preceding confinement. Except in unusual cases, this compensation is paid only when the prospective mother refrains from work not less than 8 weeks previous to confinement and is attended by a legally qualified physician.

During the first year of operation of this plan, 22,756 cases of disability occurred, of which 3002 were compensated to an amount averaging \$47.02. The average duration of illness among these compensated cases was 33 days.

The effect of holidays on the disability rate is interesting. On the day preceding Christmas eighteen reported as ill as compared with 115 on the day following. On the day prior to Labor Day there were twenty-eight cases in contrast to 138 on the day following.

All employees who are sent home ill, or who notify the company that they are detained at home through illness or injury, are called upon by the visiting nurses within 48 hr. and as often afterward as proves advisable. Those nurses whose districts are not accessible to the street car lines, are provided with coupé cars and chauffeurs. They render bedside care in emergencies, but are mainly concerned in giving instructions in personal hygiene and sanitation and seeing to it that patients follow proper medical advice.

**Special Tuberculosis Dispensary**

The tuberculosis clinic, which is also under the jurisdiction of the department of health, has been maintained because of failure of public authorities to cope with the spread of the disease, and a special dispensary has been established near the plant for employees who have contracted tuberculosis or are suspected of being tuberculous. These patients are placed on disability compensation and are kept under constant surveillance by a doctor and specially trained nurse both at the clinic and in their homes. Patients, whose home environment is antagonistic to proper treatment, are kept out of doors at the dispensary all day and when practical are given light work to keep their minds occupied without overtaxing their strength. As far as possible, sanitarium treatment is utilized for incipient cases as a means of removing the foci of infection from the community.

Following the physical and dental inspection, the records of which have been sealed so they are kept from the sight of other employees, the new worker, if he has passed all of the tests successfully, is given his application for life insurance and is told carefully of the plan of social insurance which includes life insurance and service annuities besides the disability compensation and maternity benefits.

**Insurance Policy Provided**

His insurance application is made out to a large company which seeks group insurance, and states when filled in that the employee is making application for insurance, specifies the amount, department in which he is employed, address, birth place and date, sex and beneficiary. The policy is provided for 1 year for all employees of the company who have passed the medical examination satisfactorily, and is renewed by the company yearly at its discretion. Each employee is given an individual policy showing the amount of



*Safeguards have been placed about every hazardous machine or piece of mechanism in the plant*

insurance payable to his beneficiary. The amounts are graded as follows:

Under 1 year's service.....	\$500
1 to 2 years' service.....	600
2 to 3 years' service.....	700
3 to 4 years' service.....	800
4 to 5 years' service.....	900
Over 5 years' service.....	1,000

These increases are made automatically at the expiration of each successive year of service. Upon receipt of satisfactory proof of the death of an employee, a sum not exceeding \$100 is paid for funeral expense, the remaining insurance due being paid to the beneficiaries in twelve equal monthly installments, unless, at the discretion of the officials, it may be desirable to make payment in a lump sum. Temporary lay-off because of illness or reduction of force is not considered as a break of continuity of service, though when it exceeds 1 year, it is deducted in computing the length of service. Those employees receiving service annuities are not eligible to life insurance.

**Service Annuities Paid**

The service annuities are paid to all employees who attain certain ages or have specified lengths of service to their credit. Every employee is eligible to enjoy the benefits of the plan. The annuities are paid to:

- a—Any male employee who has attained the age of 70 years, or any female who reaches 65 years, regardless of length of service.
- b—Any male employee 65 years old and any female employee 60 years old with 20 years of continuous service to their credit.
- c—Any male employee 60 years old and female employee 55 years of age with 25 years of service credited.
- d—Any male or female employee with 30 years of continuous service credited.
- e—Any employee with 15 years of service who has been permanently and totally incapacitated through no fault of his or her own as result of sickness or injury.

Service annuities are paid monthly and on a scale as follows:

For each year of active service, 1 per cent of the average monthly pay during the 10 years next preceding retirement.

Thus if an employee has been in the service 40 years and his average monthly salary or wages for the last 10 years has been \$75 per month, his service annuity would be 40 per cent of \$75 or \$30 per month. No service annuities are paid amounting to more than \$100 per month or less than \$20 per month.

The life of the worker is subject to the rules and regulations. The company reserves the right to alter or abolish these rules without incurring or retaining any liability to employees, except to those to whom service annuity has already accrued. The acceptance of annuity does not bar the worker from engaging in other work after a time, as long as it is not prejudicial to the company.

The employee, following receipt of the insurance application and explanation of the social insurance, receives an envelope which contains an outline of these plans and also instructions for safety and health and information regarding the workmen's compensation laws enacted by the State. In addition, he is given what is known as the educational bulletin and record card. These are issued every 2 weeks by the company and contain various suggestions in each issue ranging from safety cautions to inspirational discussions. This folder also contains blanks on which the worker may register his own work record with spaces for the record of days at work, number of pieces of work accomplished, daily earnings and time, and also a blank to be filled out with details of personal expense.

The payroll is so arranged that it automatically records every employee's output and registers after each pay day period, the minimum and maximum earnings for each worker and the average rate per hour earned on each operation. Special markers are placed on the records which display either a marked falling off in an individual's earnings or a failure to maintain the average of operation. All such cases are investigated to determine whether this is the result of personal inefficiency or conditions of operation. Thus, not only is a natural check put upon the incompetent worker but also, constant improvements are made in the methods of production which increase the earning capacity. All factory employees are paid weekly from booths situated conveniently to their work and the entire pay for the complete organization is distributed in 15 min.

All employees who have been absent without notice are called on by the nurses to determine the reason for not reporting to work. Before coming back to their duties they must pass through the labor control station



*Caution is the watchword throughout the factory. Signs posted everywhere warn against carelessness on the part of employees wherever accidents are possible*

where their time card has been filed, and are interviewed by representatives of the labor department. This aids to detect the laggards and also to determine those who stay home because of domestic trouble or a grievance against the work.

The labor control station also interviews all persons leaving the employ of the company, makes a thorough analysis of the reasons given and in those instances where it is possible, adjusts complaints or extends advice.

Having received the pamphlets, the worker is introduced to his department foreman and instructed in the tasks assigned to him, the general factory routine and the safety appliances surrounding his work.

#### Safety and Hygiene Department

All safety and hygiene work is under the supervision of the safety and hygiene department which is constantly making an analysis of mechanical and sanitary conditions in an endeavor to improve upon them. Practically every hazardous machine or piece of mechanism in the plant has been safeguarded. Modern well-ventilated toilets have been provided throughout the institution, and facilities for washing which are available to all employees have been greatly improved by a special model unit with separate spouts through which non-scalding water spurts as in a shower thus providing each man with running water and safe-guarding him from the infections which frequently occur when a few basins are used by many men. Liquid soap and paper towels are in each washroom. Individual lockers, heated and ventilated, are soon to be installed. Model bubble fountains of a special type which provide cold water in such a way that the lips cannot come into contact with any part of the metal basins are being installed throughout the plant.

In addition to these valuable features, the company provides lunchrooms of cafeteria style for the various factory forces. Soups, sandwiches, coffee, milk and desserts are sold on a 3-cent basis, and tickets are sold both in strips and books. The lunchrooms do not quite pay for themselves as measured with the expense of maintenance but undoubtedly are paying institutions when it is remembered that the workers secure nourishing food, are kept in the plant, and do not have to rush and bolt their meals.



*Fountain designed by the Safety department with no metal at its central point that the drinker's lips can touch*

Recreation is another phase of the general scheme. A large rest room for office girls is utilized for recreation during the lunch period and after working hours, and also as a resting place for those who are ill; and unit rest rooms are being provided in connection with the branch dispensaries for the factory force.

A large playfield set aside by the company for the use of the Goodrich athletic association, an organization which stimulates and directs all forms of athletics among the workers, comprises a running track, ball field, 9 tennis courts and plans are under way for erecting a shelter for winter games and general social features. The girls have a camp-site for the summer months on the border of a nearby lake. In these recreational features, the company is always willing to render financial assistance, but prefers that the initiative and the organization should come from the workers.

Extensional assistance is offered in various forms, such as aid given workers involved in legal difficulties. No court work is done, but arrangements are made for the securing of competent legal counsel at a reasonable cost.

A list of houses and rooms for let and of boarding houses is maintained.

A census taken in May, 1916, determined that 49 per cent of all the factory workers were foreigners. Of these only 10 per cent were naturalized, and 48 per cent had a good knowledge of English. There were 37 different nationalities. The company through its bureau of education is co-operating with the public schools in an effort to give adequate instruction in English, civics and elementary subjects.

#### 1200 Volumes in Library

A house magazine, the Circle, issued monthly, aims to interpret the spirit of the company toward the workers and to recognize and stimulate social activities. A library containing 1200 volumes is at the disposal of all and more than 3000 periodicals are received each month and distributed to those interested.

It is through these unusual plans that Goodrich hopes to secure an improved relationship between itself and its workers. The plans, founded on the basis that justice in industry can

come only through intelligent leadership and cordial co-operation, should begin to display results in the next few years. At this time, statements of progress, according to the company's officials, would be haphazard and unsubstantial, since the work is still new and experimental. While definite results have not as yet been obtained, there is hope that a scheme based on health is sound and will bring many benefits which will be important to every employer of labor.

## Complete Cork Clutch Facing Possible

(Continued from page 425)

Cork gaskets are easily applied with a thin coating of waterproof cement, or shellac, spread over one of the contact surfaces. Care should be taken not to use too much cement, as otherwise it might squeeze through the bolt holes, causing the gasket to stick on both sides when assembled. The gasket should be weighted down until the cement is thoroughly dry before assembling the parts.

#### Used for Washers, Packing, Etc.

Washers of cork composition have the same characteristics and are used extensively to prevent rattling and the entrance of dust. They are also used in connection with stuffing boxes where the shaft speed is not high enough to generate heat much above that of boiling water. Not only do they protect the bearings against dust, but they stop oil and grease leakage.

Floats for carbureters, oil gages and gasoline gages are invariably made of natural cork rather than composition. These are produced in several styles to conform to individual specifications. Experience has shown that floats should be coated with a material similar to shellac to give the best results.

Natural cork clutch inserts are supplied in four grades. Natural cork washers for various purposes and natural cork plugs for wire conduits, spark plug holes, etc., are also furnished.



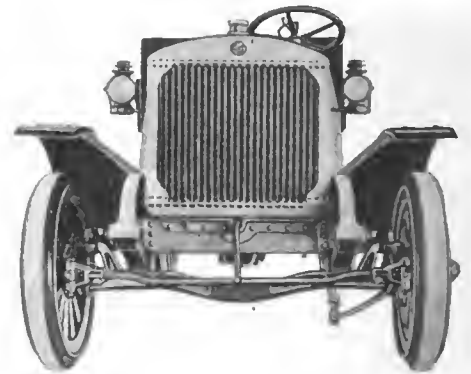
## How Continental Tests Flywheels for Accuracy

**T**HE accompanying illustration shows the method of testing flywheels at the Continental Motors Co., Detroit. The method of correctly finding out whether a flywheel is true or not is by testing with an indicator dial.

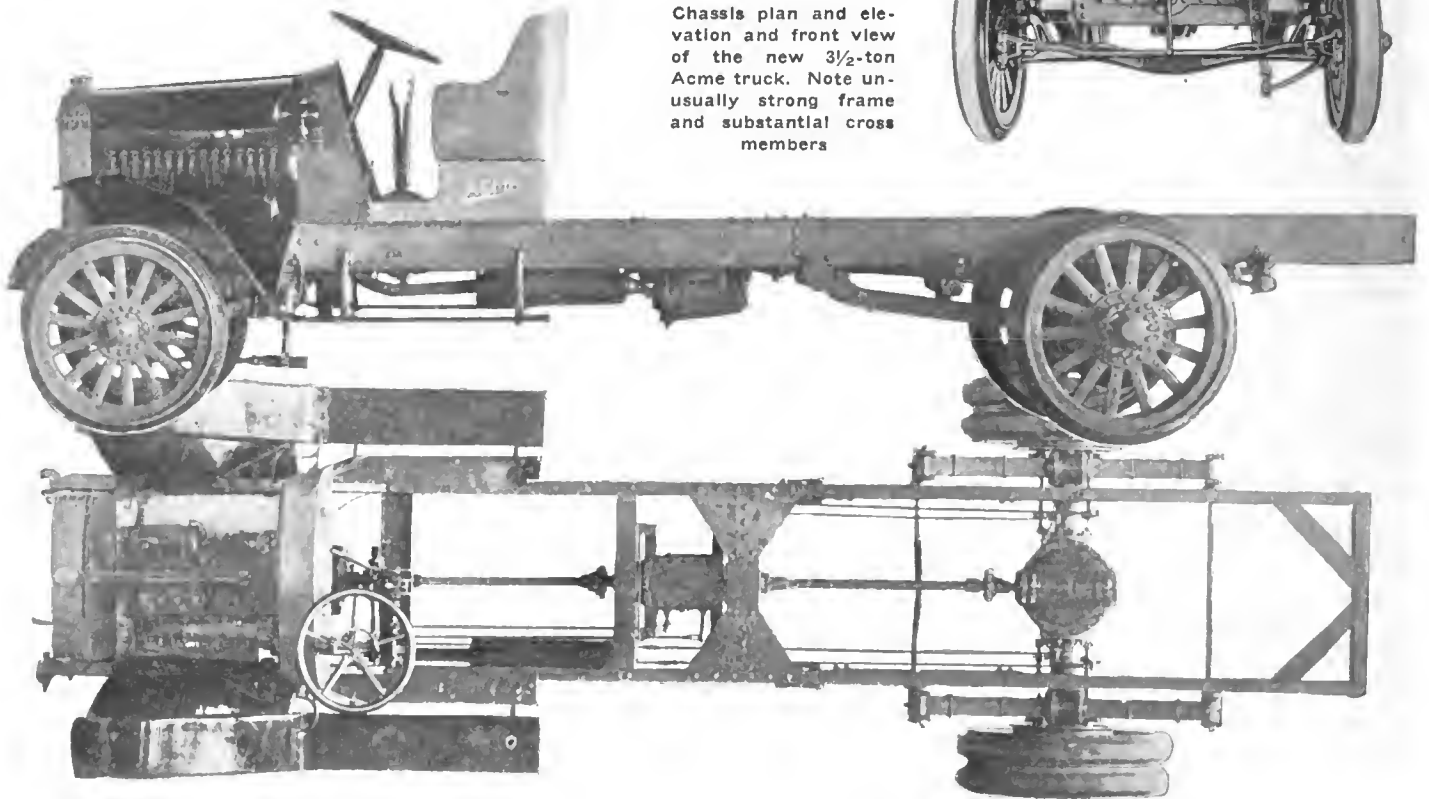
No flywheel which varies in accuracy beyond the prescribed limits is allowed to get by the tester as any inaccuracy will be detected in the motor test department.

The fixture shown herewith is only one of the many interesting details revealed at the big Detroit plant of the company.

## 3 1-2 Ton Acme Model for Heavy Hauling



Chassis plan and elevation and front view of the new 3 1/2-ton Acme truck. Note unusually strong frame and substantial cross members



**A** THREE AND ONE-HALF-TON model has been added to the line of the Cadillac Auto Truck Co., Cadillac, Mich., builder of the Acme 1- and 2-ton trucks. This is designed to meet the requirements of heavy hauling, and completes the company's line. The Acme 1-ton truck is designed to correspond to the requirements of the same type of traffic as would be used with a one-horse dray or delivery wagon. The 2-ton truck is designed to correspond to the two-horse team, and the new 3 1/2-ton to cover the field of heavier weight which has been found to be growing rapidly throughout the country. As would be judged from the class of work to be handled, the new Acme truck is a heavy-duty machine throughout, featured by rigid construction of frame and live members.

### Worm Drive and 50-hp. Engine

In general, the new job is a 3 1/2-ton worm-drive truck which may be fitted with any type of special or dump body to meet particular hauling problems. It has a wheelbase of 168 in., and a loading space of 150 in. The turning radius is 29 ft., and the tread is 66 1/4 in. in front and 65 1/4 in. in rear. It is equipped with a Continental 50-hp. engine, the power being secured on brake test by the Continental company. It has four cylinders cast in pairs, L-head, with a bore and stroke of 4 1/2 by 5 1/2 in. The connection between the driving members and the chassis frame is flexible. The engine is mounted at three points with the gearbox amidship and connected with the drive by two universal joints, and with two additional universals on the propeller shaft, giving four universals in the drive between the power plant and the rear axle.

The engine is the stock Continental type E, fitted with a Pierce governor limiting the speed to 1200 r.p.m. and the truck to 14 m.p.h. Like the other Acme models, this truck is equipped with Rayfield carbureter, Eisemann magneto and Stewart vacuum feed.

In the 1- and 2-ton Acmes, the gearbox is mounted in unit with the engine, but in the new model the amidship location has been chosen in order to break the drive into shorter section. This also divides the weight and distributes it more evenly along the chassis. The transmission units are of the sliding clutch type, with the gears always in mesh. The gears instead of revolving with the shaft by means of splines run free and the hook-up of the shafts and gears is accomplished by a series of dog clutches. One part of the clutch is cut into the face of the gear, while the other slides upon the squared shaft.

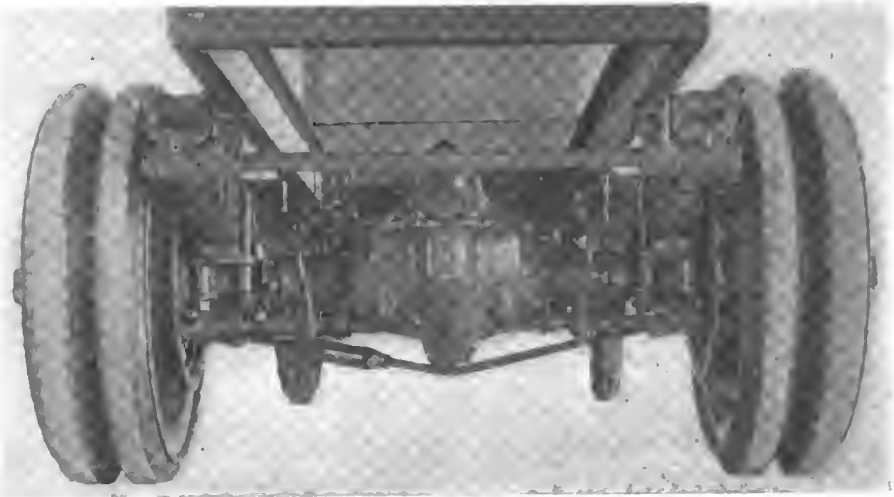
The gears are mounted upon roller bearings which are fitted into the gear hubs. The clutch arrangement is such that when the gearset is in high gear, the other gears are idle. The face of the gear is 1 1/2 in. wide. Between the engine and the transmission the shaft is of heat-treated steel, 1 1/2 in. in diameter, and the shaft between the gearset and rear axle is of 1 1/4 in. diameter. Three speeds forward and one reverse are provided. The ratios are, in first, 4 to 1; second, 2 to 1; third, 1 to 1; reverse, 4.125 to 1. The reduction in the rear axle is 10 1/2 to 1.

Timken axles, both front and rear, are used. The rear axle is floating, with the axle shafts forged in one piece, heat-treated and splined on one end. With the ratio of 10 1/2 to 1 in the axle, the total reduction in low speed is 41 1/2 to 1, a

sufficient drop to pull the truck through any road on which traction can be secured. The service and emergency brakes are internal expanding, with 21-in. drums on the rear wheels. The extra large brake surface is another point which may be noted in connection with this chassis.

The type of drive used on the Acme 3½-ton truck differs from previous practice. On the 1- and 2-ton trucks Hotchkiss drive is utilized, with the propulsion taken through the top leaf of the rear springs. In the Acme 3½-ton truck the drive is taken through radius rods which are semi-flexible, thereby eliminating the necessity of universal joints and allowing of simple connections. This also carries out the flexible connection scheme between the live members of the chassis and the chassis frame. The torque is taken by the springs in the same manner as on the smaller Acme models.

Another change in Acme construction which may be noted in the 3½-ton model is the adoption of a cast radiator tank instead of the sheet metal tanks used on the 1- and 2-ton jobs. The change in the mounting of the radiator has not been on account of any difficulties with the mountings on the smaller models, but is done because it is thought that, with the heavier spring design, impacts may be transmitted to the radiator. This, of course, is impossible with the smaller models on account of their lighter spring design. The radiator is detachable and is supported from the bottom on a cushion base. The radiator is a Long, and the water is circulated through it by means of a centrifugal pump. One of the points which may be noted is the strength of the frame. This is of 8-in. section rolled steel channel, fitted with the cross members shown in the illustrations, which are gusseted and hot-riveted. The springs are Detroit made, self-lubricat-



Rear of new 3½-ton Acme chassis, showing Timken worm drive axle, heavy springs, large braking surface and dual rear tires. Drive is through semi-flexible radius rods and torque is taken by the springs

ing, bronze bushed, the front being 3 in. wide by 42 in. long, and the rear, 3½ by 54 in. The radius rods which take the drive are of rolled steel section and semi-flexible, a very desirable feature.

14-ft. Body Standard

The overall length of the chassis is 243 in., and it is designed to accommodate a 14-ft. body as standard. Although the wheelbase is 168 in., the truck will be furnished with a longer wheelbase when desired. The gasoline capacity is 27 gal.

The truck is completely equipped, including seats, lamps, horn, jack and tools. The gasoline tank is welded steel. The wheels are artillery with 3-in. spokes rear, and 2¼-in. spokes front. Front tires are 36 by 5 in., and rear, 40 by 8 in., or 40 by 5 in. duals optional. The price of the truck, f.o.b. factory, is \$3,000.

Exports of Automobiles, Trucks and Parts for December and 12 Previous Months

	December				Twelve Months Ending December			
	1915		1916		1915		1916	
	No.	Value	No.	Value	No.	Value	No.	Value
Passenger cars .....	3,664	\$2,710,758	4,911	\$3,658,660	41,864	\$35,045,090	61,947	\$43,725,087
Commercial cars .....	1,664	3,910,533	1,331	3,689,314	22,094	58,839,303	18,903	52,870,774
Parts, not including engines and parts .....		1,791,805		1,755,333		16,670,452		24,001,060
	5,328	\$8,413,096	6,242	\$9,113,307	63,958	\$110,554,845	80,850	\$120,696,921
<b>BY COUNTRIES</b>								
Denmark .....			109	\$96,496			1,516	\$1,126,953
France .....	423	\$1,034,581	596	1,898,494	6,304	\$15,922,313	8,477	23,279,846
Germany .....					4	2,800		
Italy .....	31	15,494	29	13,228	257	160,368	285	171,231
Russia .....			30	82,492			3,140	8,546,563
United Kingdom .....	1,366	1,969,048	597	1,507,461	24,356	35,057,597	9,198	17,083,616
Other Europe .....	608	1,272,807	198	222,192	8,640	22,330,357	4,831	4,647,736
Canada .....	348	259,110	406	451,685	5,796	4,622,931	12,183	8,965,200
West Indies and Bermuda .....	308	197,512	464	297,061	3,248	1,877,680	5,935	3,922,906
Argentina .....			461	243,613			5,105	2,723,705
Brazil .....			75	35,804			467	292,682
Chile .....			313	186,314			1,442	955,394
Venezuela .....			58	35,393			556	360,315
Other South America .....	751	363,748	198	102,508	3,537	1,862,326	1,148	708,389
British East Indies .....			577	452,312			4,573	3,359,379
Australia .....	392	371,323	230	197,607	4,818	4,075,299	7,567	5,727,233
Other Asia and Oceania .....	583	762,921	1,291	1,091,641	4,332	6,748,367	9,034	10,842,305
All other countries .....	455	326,682	497	353,063	2,494	2,063,863	4,669	3,251,632
Mexico .....	63	58,065	113	80,590	172	160,467	724	603,776
	5,328	\$6,631,291	6,242	\$7,347,954	63,958	\$94,884,368	80,840	\$96,568,861

# ACCESSORIES

## Positive Brazing Paste

**A**DVANTAGES claimed by the manufacturer for this paste are that it repairs the broken metal all the way through; does not change the size of the part repaired; does not require as great heat as welding; can be done at low cost; makes joint stronger than it was originally; will braze steel to cast iron or any kind of iron one to another, and that it will braze copper to anything made of iron or copper.

In applying the paste rust and grease are removed from the part to be repaired, the pores are filled with paste which is well rubbed in, and after clamping the work in position heat is applied. When the iron is white hot an inch each side of the break borax is applied and then spelter is run thoroughly into the break. When the iron has cooled sufficiently to turn black the work may be taken from the clamp.—Ferro-Brazing Paste Co., 1423 Farragut Avenue, Chicago.

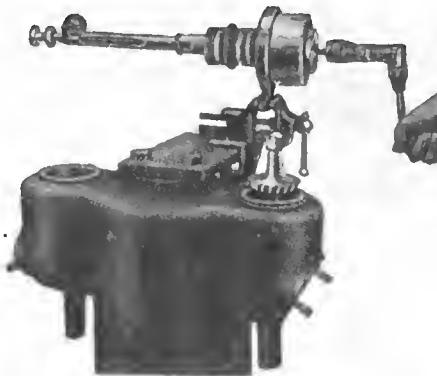
## Ellis-Smith Valve Reseater

In refacing valves and valve seats, the operation of this device is as follows: A vise is clamped to a wooden base bolted to the cylinder head, holding the seat cutter reamer guide and valve refacing fixture. The valve is held in the refacing fixture and rotated against a steel knife by means of a bit brace, cutting the proper bevel on the valve. For refacing the seat, a seat cutter is placed in the pilot stem and rotated by the bit

brace. It is claimed that warped valves may be refaced and seats finished without chatter marks. Price, \$30.—Ellis-Smith Mfg., Co., 216 Niagara Street Buffalo.

## Helping Henry

All sorts of makeshift devices for transmitting power from the rear wheels of an automobile to machinery, tools, etc., have been developed from time to time, but the Helping Henry is a simple, practical belt-power attachment designed to meet all kinds of conditions. In operation it is placed in position under the rear axle and the two handles and the base rod are pushed down at the same time, thus jacking up the rear wheels and drawing the tires into contact with the rollers of the attachment. Pressure at



Ellis-Smith valve reseater in operation

this point is only about 25 lb., enough to prevent slippage, as the framework of the device supports the car weight. The method of drive is illustrated herewith, the device in this instance being connected to a drill press. Various size pulleys are furnished for the manifold uses to which the Helping Henry can be put. Specifications include malleable castings, channel iron frame, ball-and-socket self-aligning, high-speed, babbitted bearings and large oil cups. The device weighs 135 lb.—Autopower Co., LaPorte, Ind.

## Vincent Clear-Room Wheel

The feature of this steering wheel is that it may be dropped to a tilted position as illustrated herewith, thus giving a wide passage past the driver's seat. A locking arm secured to the steering post and consisting of 7/16-in. hardened and ground taper steel pins on each side of the head and forming wearing plates carries the Clear-Room wheel pivoted on a special spider on its outer end. The locking arm is secured to the post in the same manner as the original wheel. A touch releases the wheel from the driving position to a clearance of over 8 in. Spiders are of close-grained aluminum and the corrugated walnut rims are dished. There is a plain ebony rim on the Ford 16-in. size. Price, largest size, \$12; Ford type, \$6.50.—Vincent Clear-Room Steering Wheel Co., 765 Woodward Avenue, Detroit.

## Battle Creek Vulcanizer

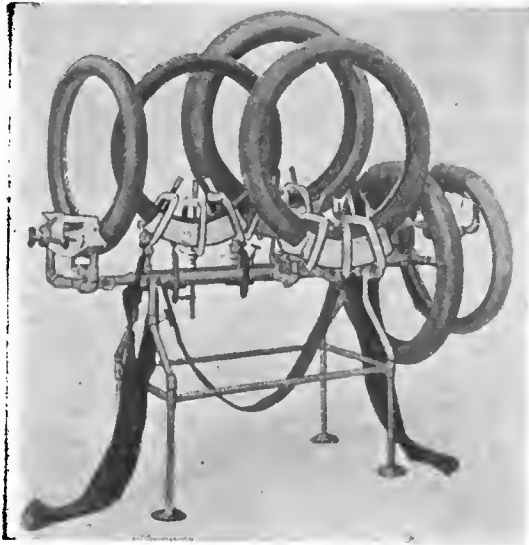
A large and light machine for the repair of casings or tubes. Steam is generated in a convenient boiler and circulated through the hot-plates in a manner that keeps it dry and live. Six casings and several tubes may be treated at one time, and though held so as to occupy a minimum space are still accessible to the workman. Each unit is controlled



Helping Henry belt power attachment transmitting drive from the rear wheels of a car to drill press. It jacks up the rear wheels which actuate the jackshaft by rollers



The Vincent Clear-Room Steering Wheel. Left—Detail of the wheel in the tilted position. Right—The wheel in use. Note the wide passage by the driver's seat



At the left is illustrated the Battle Creek steam vulcanizer for the repair of casings or tubes. Six casings and several tubes may be treated at one time

At the right is the Atlas Arbor press for repairshop work. Operating under a leverage of 160 to 1, one man is said to be able to exert a force of 20 tons. Work 20 in. in diameter and 18 in. deep can be handled



by a globe valve, and one or all may be heated at the same time. Price, Model B, \$250, with all bench tools and special clamps; boiler not included.—Battle Creek Vulcanizing Equipment Co., Battle Creek, Mich.

**Warner Wheeltilt**

This device was described in THE AUTOMOBILE for Feb. 1 as one of the new devices brought out at the Chicago show, but the price was given as \$5, whereas it should have been \$1.50. As shown in the illustration it consists of a snap hinge which converts the Ford steering wheel into a tilting type, a strong, simple latch holding it securely when in use and being easily snapped out when to move the wheel into the tilting position.—Warner Gear Co., Muncie, Ind.

**Konsrv Engine Warmer**

An electric heater placed beneath the hood keeps the motor and radiator warm, facilitating easy starting. It is attached to any 110-volt lighting circuit, using 100 watts per hour. It sells for \$5.—Konsrv Electric Co., 2041 East Third Street, Cleveland, Ohio.

**Detroit Hub Cap for Fords**

This cap is designed to impart a more substantial appearance to the Ford wheel and to cover points on the metal flange and bolts at the hub which frequently become rusty. The hub cap also makes the

running board appear lower. Selected 20-gage steel is used in the caps, which simply replace the standard Ford caps. They are finished in polished nickel on a heavy copper base and are furnished in cartons each containing a set of four and listing at \$3.75 per set.—Harry Svensgaard Sales Corp., 214 Jefferson Avenue East, Detroit.

**Atlas Arbor Press**

The Atlas is an arbor press for repairshop work. Operating under a leverage of 160 to 1, one man is said to be able to exert a force of 20 tons. The frames are of special iron, the pinions and rams from heat-treated alloy steel, and all other parts from materials chosen to meet the hardest service. Work measuring 20 in. in diameter and 18 in. deep can be handled, and will remove arbors measuring up to 5 in. The weight of the

press with base is 650 lb. Price, No. 24, \$80; without legs, for bench, \$70.—Atlas Press Co., Kalamazoo, Mich.

**Ulticoat Heat-Proof Paint**

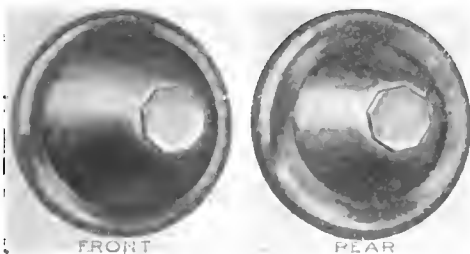
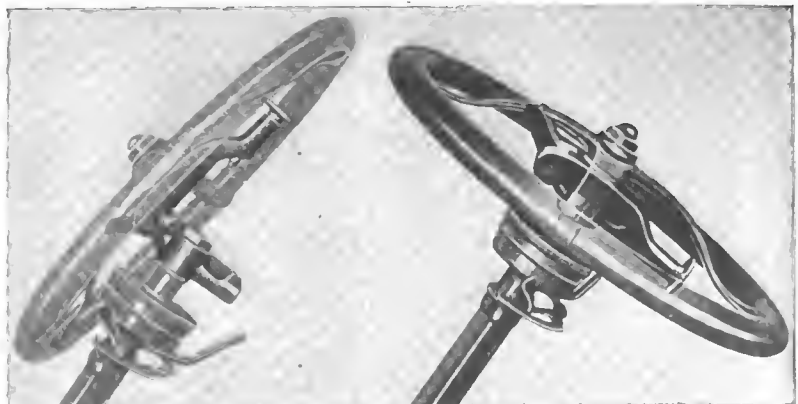
Ulticoat is a mineral paint for use on the exhaust pipe, muffler, hood, and all metal parts subject to heating. It is stated by the manufacturer that heat causes the paint to stick harder to the surface to which it is applied. Price, \$1 per can.—Porcelain Products Co., Pittsburgh, Pa.

**Radio Car Heater**

Exhaust gases pass directly through the body of the heater, connections being made to the exhaust by a 1-in. pipe, passing to the heater proper, which is set flush in the floorboards. This heater is a pressed metal box 14½ in. long, 5 in. wide and 3 in. deep. It is claimed to heat a limousine comfortably and to be a good foot warmer for open cars. The installation may be made by anyone in 2 hr., it is said. Price, \$8.—Milwaukee Auto Specialty Co., Milwaukee.



Radio exhaust type car heater



Above—Detroit hub caps for Ford cars selling for \$3.75 per set  
Right—Warner wheeltilt for Fords which sells for \$1.50



# Industrial Miscellany

## Factory

**Saxon Motor Car Corp.**, Detroit, has its present offices at 621 Bellevue Avenue, and the factory is occupying quarters at Beaufait Avenue and Sylvester Street.

**Paige-Detroit Motor Car Co.**, Detroit, has purchased 33 acres of land adjacent to the new site of the Saxon Motor Car Co.'s new plant.

**C. R. Wilson Body Co.**, Detroit, has secured the plant of the Hargreaves Mfg. Co. and will use the 80,000 sq. ft. of floor space it contains for making closed bodies of every type.

**Electric & Auto Parts Co.**, the Morgan & Wright Tire Rim & Wheel Co. and the Economy Metal Stamping Co. have joined with several other manufacturers in the erection of a suburban community near Cleveland, where each will construct factories.

**Pan-American Motors Corp.**, Chicago, manufacturing the Chicago Light Six-Forty, is seeking a location for a factory in some Illinois city. Should some inland city of Illinois be selected as a site for the factory, the name of the car will be changed to that of the city chosen.

**Willys-Overland Co.**, Toledo, has purchased the ground and experimental plant of the Libbey-Owens Sheet Glass

Co., at a price in excess of \$165,000. The purchase was made in anticipation of further expansion of the Overland company.

**Perpetual Spark Plug Co.** will build a new factory in Dunmore, Pa. The plant will cost \$30,000 and will be 30 by 174 ft. By the addition of new machinery the production will be increased from 1500 to 30,000 spark plugs per day.

**Auto Body Co.**, Lansing, Mich., is running some of its departments night and day on account of press of business. Three hundred men are being employed on the night shift in the machine shop alone. Nearly 1400 men are now in the employ of the company, where but 850 were working a few months ago.

**National Acme Machinery Co.**, Cleveland, will install what is reported the largest wood block factory floorspace in one area in the United States. The structure will be 532 by 600 ft.

**Akron Rubber Mold & Machinery Co.**, Akron, will increase its capacity and add some new equipment.

**Briggs Mfg. Co.**, Cleveland, which paints and trims bodies for the Chandler Motor Car Co., is putting a four-story addition on to its factory. The annex is 220 by 100 ft. and will cost \$150,000. When completed the plant will have a

capacity of 150 car bodies a day. Plant now employs 100 and will later take on 150 more.

**Brockway Motor Truck Co.**, Cortland, N. Y., has had plans prepared for a one-story cement block addition to its machinery shop, 50 by 200 ft.

**Ford Motor Co.**, Ford City, Ont., is making arrangements for a concrete addition to its plant at London, Ont., to cost \$25,000.

**Prospect Auto Top Co.**, Cleveland, has made plans for a factory which will cost \$20,000.

**G. G. Bayne Co.**, Bushnell, Ill., maker of automobile specialties, will build a factory, 96 by 126 ft., costing \$75,000.

Detroit automobile plant, it is stated, will be moved to L'Anse, Mich.

**Boone Tire Co.**, Sycamore, Ill., has decided to establish a branch plant with a capacity of 200 tires and tubes daily, in Chippewa Falls, Wis., local capital having agreed to invest \$28,500 under an ample guarantee. I. V. MacLean is general manager.

**Houk Mfg. Co.**, Buffalo, is erecting a \$25,000 addition to its factory.

**Selden Truck Sales Co.**, Rochester, N. Y., has begun work on a new building which will afford 14,000 sq. ft. of floor space.

## The Automobile Calendar

### CONTESTS 1917

- April—Los Angeles to Salt Lake City Road Race.  
 May 19—New York Metropolitan Race on Sheepshead Bay Speedway.  
 May 30—Indianapolis Speedway Race, Championship.  
 June 9—Chicago, Ill., Speedway Race, Championship.  
 June 23—Cincinnati, Ohio, Speedway Race.  
 July 4—Omaha, Neb., Speedway Race, Championship.  
 July 4—Tacoma, Wash., Speedway Race, Championship.  
 July 14—Des Moines, Iowa, Speedway Race, Championship.  
 Aug. 4—Kansas City Speedway Race.  
 Sept. 8—Cincinnati, Ohio, Speedway Race, Championship.  
 Sept. 15—Providence, R. I., Speedway Race, Championship.  
 Sept. 29—New York, Speedway Race, Championship.  
 Oct. 6—Kansas City Speedway Race.  
 Oct. 13—Chicago, Speedway Race.  
 Oct. 27—New York Speedway Race.

### SHOWS

- Feb. 17-24—Albany, N. Y., Sixth Annual, State Armory, Albany Automobile Dealers' Assn.  
 Feb. 18-25—St. Louis, Mo., Show, Automobile Manufacturers' and Dealers' Assn.  
 Feb. 19-24—Springfield, Ohio, Show, Memorial Hall, Springfield Automobile Trade Assn.

- Feb. 19-24—Pittsfield, Mass., Show, Armory, J. J. Callahan, Mgr.  
 Feb. 19-24—Portland, Me., Exposition Building.  
 Feb. 19-24—Grand Rapids, Mich., Show, Automobile Business Assn. of Grand Rapids.  
 Feb. 19-24—Duluth, Minn., Show, Duluth Auto Dealers' Assn., Armory.  
 Feb. 19-24—South Bethlehem, Pa., Show, Coliseum.  
 Feb. 19-24—Bridgeport, Conn., Show, Armory, Coast Artillery Corps.  
 Feb. 19-24—St. Louis, Overland Bldg., St. Louis, Auto Dealers' Assn.  
 Feb. 19-24—Syracuse, N. Y., Show, State Armory, Syracuse Dealers' Assn.  
 Feb. 19-24—Pittsfield, Mass., J. J. Callahan, Mgr.  
 Feb. 20-24—Salt Lake City, Utah, Inter-Mountain Automobile Show, Bonneville Pavilion, W. D. Rishel, Mgr.  
 Feb. 21-24—Wausau, Wis., Grand Opera House, Wausau Automobile Dealers' Assn.  
 Feb. 21-24—New London, Conn., Armory.  
 Feb. 21-24—Flint, Mich., Coliseum, Lake Side Park, E. W. Jeffers, Mgr.  
 Feb. 21-24—Trenton, N. J., Armory, Trenton Automobile Trade Assn.  
 Feb. 24-Mar 3—Newark, N. J., Show, Palace Ballroom.  
 Feb. 24—March 3—Brooklyn, Show, 23rd Regiment Armory.  
 Feb. 24-March 3—Atlanta, Ga., Automobile Dealers' Assn., Auditorium.  
 Feb. 26-March 3—Great Falls, Mont.

- Feb. 26-March 3—Omaha, Neb., Show, Auditorium, Omaha Automobile Show Assn.  
 Feb. 26-March 3—Utica, N. Y., Utica Automobile Dealers' Assn., State Armory.  
 Feb. 26-March 3—Wilkes-Barre, Pa., Hugh B. Andrews, Mgr.  
 Feb. 27-March 4—Atlanta, Ga., Show, Auditorium, Atlanta Auto Trades and Accessory Assn.  
 March 1, 2, 3—Urbana, Ill., Show, Automobile Trade Assn. of Champaign Co., Armory of the University of Ill.  
 March 3, 4, 5—Green Bay, Wis., Show, Green Bay Automobile Dealers' Assn.  
 March 3-10—Boston, Mass., Show, Mechanics' Bldg., Boston Automobile Dealers' Assn.  
 March 3-10—Washington, D. C., Middle Atlantic Motor Assn., Inc., Union Bldg.  
 March 5-10—Brooklyn, Truck Show, 23rd Regiment Armory.  
 March 5-10—Jamestown, N. Y., Jamestown Automobile Dealers' Assn., Armory, C. A. Hanvey, Mgr.  
 March 5-12—Birmingham Ala., Auditorium.  
 March 6-9—Fargo, N. D., A. Hanson, Mgr.  
 March 6-10—Fort Dodge, Iowa, Northern Iowa Show, New Terminal Warehouse, G. W. Tremain, Secretary.  
 March 7-10—St. Joseph, Mo., Auditorium, St. Joseph Automobile Show Assn.  
 March 10-17—Zanesville, Ohio, Muskegon Motor Club.  
 March 12-14—Fort Worth, Tex., Fat Stock Show, Coliseum.  
 March 12-17—Vancouver, B. C., British Columbia Automobile Assn., Horse Show Bldg.

- March 13-16—Fargo, N. D., Armory and Auditorium.  
 March 14-17—Mason City, Ia., Armory, Mason City Automobile Dealers.  
 March 14-17—Davenport, Iowa, Show, Coliseum Bldg., Tri-City Auto. Trade.  
 March 17-21—Manitowoc, Wis., F. C. Borchardt, Jr., Mgr.  
 March 17-22—New Haven, Conn., Show, Hotel Taft.  
 March 17-24—Pittsburgh, Pa., Motor Square Garden, J. J. Bell, Mgr., Automobile Dealers' Assn. of Pittsburgh.  
 March 18-23—Cedar Rapids, Ia., Cedar Rapids Automobile Trades Assn.  
 March 19—Paterson, N. J., Sixth Annual, Auditorium, R. A. Mitchell, Mgr.  
 March 21—Trenton, N. J., Second Regiment Armory, J. L. Brock, Mgr.  
 March 27-31—Deadwood, S. D., Fifth Annual, Deadwood Auto Show, J. E. Nelson, Mgr.  
 March 31-Apr. 14—Atlantic City, Garden Pier, S. W. Megill, Mgr.  
 April—Milwaukee, Wis., Spring Show, Milwaukee Automobile Dealers.  
 April—Calumet, Mich., Show, Coliseum, Frank Ketchell, Mgr.  
 Apr. 4-7—Stockton, Cal., Second Annual San Joaquin Auto Trades Assn., Samuel S. Cohn, Mgr.  
 Sept. 2-9—Spokane, Wash., Interstate Fair.  
 Sept. 9-15—Milwaukee Show, State Park Fair, West Allis.  
 Sept. 9-15—Milwaukee, Wis., Fall Show, Wisconsin State Fair, West Allis, Milwaukee Automobile Dealers.

# Car Buyers Now Know the Meaning of Velie Values



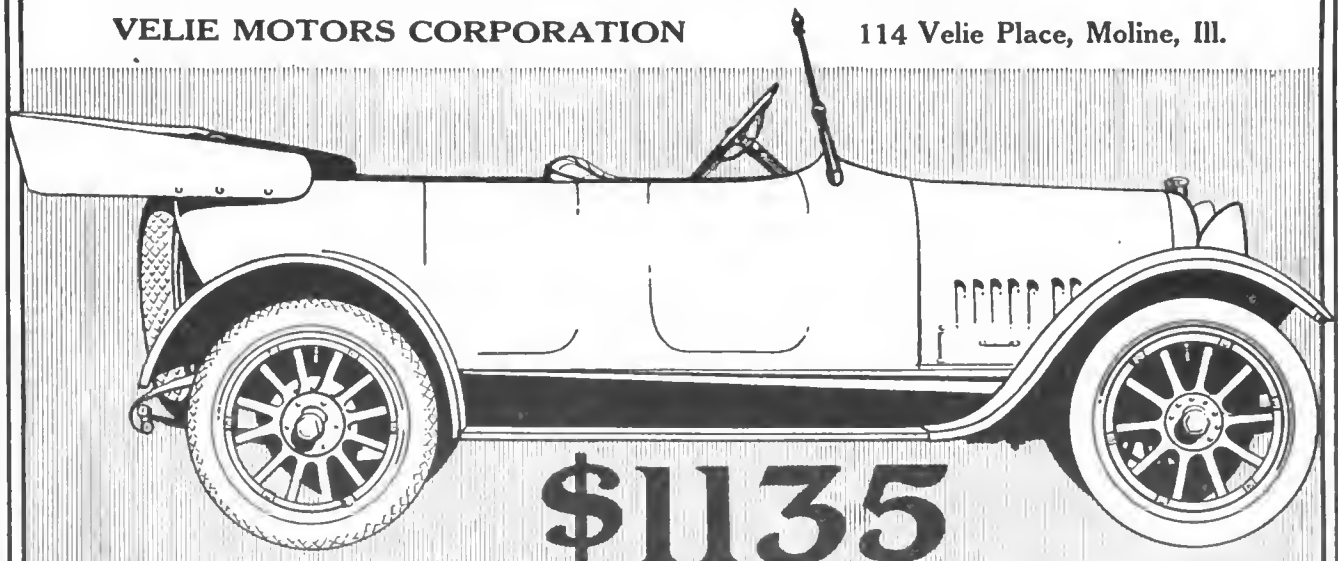
THEY have been to the Automobile shows. Side by side with ordinary cars they have marveled at the superiority of Velie Biltwel Six—the Bigger—Better—More Powerful Car—the car for the woman driver as well as the man.

They have made their own comparisons. They realize *how much more* the Velie offers at its low price. The Velie's deep-tufted, genuine leather upholstery—long, roomy body—powerful Velie *special* Continental motor—Timken axles front and rear—multiple


disc clutch—long, underslung springs—push button starter—every Velie feature is a more powerful sales force today than ever before. Eight body styles open and closed give a range of choice for every customer. Send for our liberal proposition.

VELIE MOTORS CORPORATION

114 Velie Place, Moline, Ill.



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**Flawless**  
  
**Non-Gran**



## Bushings of Non-Gran wear longer than bushings made of any other known metal

This is a strong statement to make, yet ten years' performance on most of America's high-priced cars, on the bulk of record-holding speed cars, and on the majority of taxicabs in this country proves it conclusively.

Bushings made of Non-Gran will outwear any other bronze bushings made.

So when you have your car overhauled be sure that your repairman replaces all worn bushings with bushings of Non-Gran—even though the Non-Gran equipped job may cost you five or ten dollars more.

A complete job of overhauling costs

from \$100 to \$200. This charge is principally for labor.

You will be wise, then, to spend this five or ten extra dollars to get Non-Gran, because Non-Gran will make your car stand up as it never stood up before, and will save you hundreds of dollars in future heavy labor bills.

Practically all manufacturers of high-grade cars and motors use bushings of Non-Gran. They appreciate its importance in adding years of uninterrupted service to their products.

No other part of a car is more subject to wear than the bushings, conse-

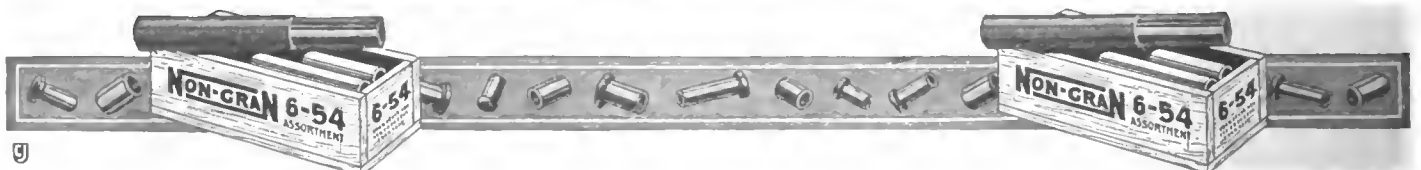
quently no other part of a car is the cause of more overhauling expense.

One big reason why high-grade cars give years longer service is because their bushings are made of Non-Gran and not the usual run of bearing bronze. Cars rattle to pieces quickly, only because the bushings and bearings used are of a quality that cannot stand the strain.

**American Bronze Company**  
 Berwyn • • • Pennsylvania

Sole Makers of Non-Gran Bronze and largest exclusive manufacturers of Bearing Bronze in the World.

HIGH SPEED  
**NON-GRAN**  
 BEARING BRONZE



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## TAKE OUT THAT KNOCK

**THAT knocking in your engine**, the difficulty you have negotiating hills—the poor acceleration response—lack of power—extravagant use of oil and gas—noisy motors—in fact fully 80% of your engine trouble is caused by just one thing—carbon in your cylinders. Clean them out with

### JOHNSON'S CARBON REMOVER

and your engine will run like it did the first 500 miles—quietly and full of "pep". **No matter how choked up** your motor may be Johnson's Carbon Remover penetrates and softens the carbon—then the heat from the engine burns and pulverizes it so that it blows out of the exhaust as you operate your car.

#### YOU CAN DO IT YOURSELF

Why pay from \$3.00 to \$5.00 for having the carbon burned out of your cylinders when you can easily do it yourself **without laying up your machine**, without even soiling your hands. You can apply it to the motor warm or cold and let it remain in an hour or over night, whichever is the most convenient.

#### SAVES GASOLINE

Clean cylinders reduce the consumption of gas from 12% to 20% giving you the maximum power and speed from the minimum amount of fuel. Johnson's Carbon Remover **saves you money** because the economy in fuel effected by its use more than makes up the price of the Carbon Remover.

#### SAVE YOUR BATTERIES

There is nothing that runs down your batteries like the self-starter. Free-from-carbon cylinders greatly facilitate starting. The use of Johnson's Carbon Remover every 1000 miles will keep your engine clean and sweet and always at its highest efficiency. It does not in any way injure the oil in the crank case.

#### OUR GUARANTEE

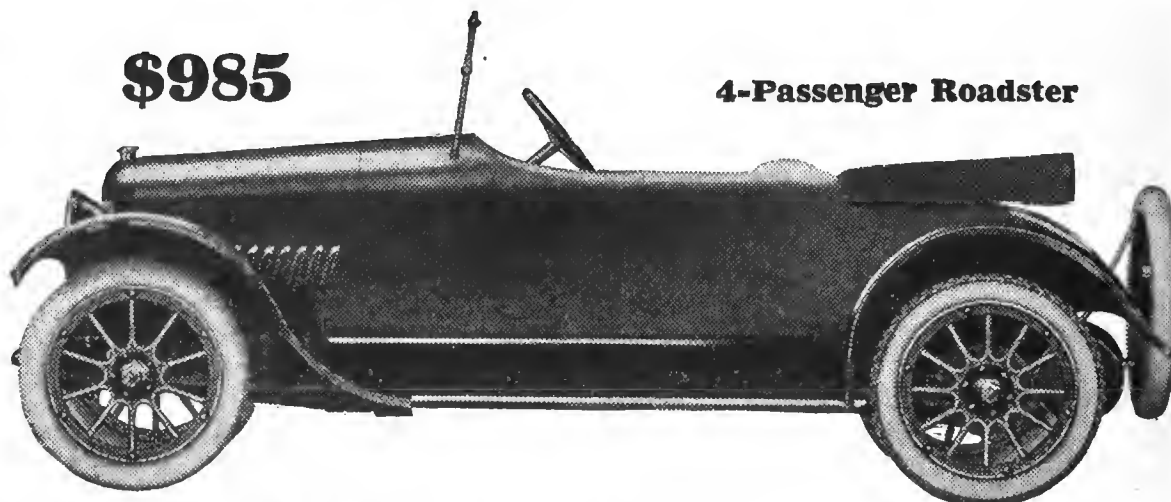
You take no chances for we guarantee Johnson's Carbon Remover without equivocation. **No matter how much you use or how you use it, Johnson's Carbon Remover cannot injure any part of your motor.** It is absolutely harmless to everything except carbon. You could soak your engine in it for days without the slightest injury. We guarantee it to be free from acids and chemicals.

**\$1<sup>00</sup> Special Offer \$1<sup>00</sup>**

We will send you by prepaid express for \$1.00 (bill or stamps) enough of Johnson's Guaranteed Carbon Remover to thoroughly clean any ordinary four cylinder motor three times. — Please give us the name of your dealer.

**S. C. JOHNSON & SON**  
Dept. A., Racine, Wis.





**"The Car of the Hour"**

5-Passenger Touring

**\$985**

**Elgin Six**

4-Passenger Roadster

**\$985**

**DEALERS:**

**Measure the Elgin Six Against \$985**

Your verdict will be: "Under-priced by several hundred dollars."

—Yet we are making a legitimate profit.

Note the style, size and specifications that will enable you successfully to compete with high-priced cars in quality—and beat them in price.

Consider the Elgin velvet-acting clutch, that eliminates gear-shifting and enables this "Beauty of the Road" to be started on "high" under ordinary conditions, thus removing the last obstacle to the successful handling of a motor car by women.

Note the improved cantilever rear spring suspension, found only on the Elgin Six, that has set a new standard of motoring ease and comfort at high speed. You can safely and comfortably drive the Elgin Six at 35 to 50 miles per hour over roads so rough that the average car is limited to 15 to 25 miles per hour.

And as for style and beauty—no other car selling under \$1250 has the fashionable center cowl of the high-priced European models. The beautiful yacht line design of the Elgin Six was established by a famous artist, and gives this car a distinction that sets it aside from the monotony of the common designs of average cars.

**NOTE:** The Elgin Six, in addition to establishing a new record of 67½ hours between Chicago and Miami, Fla., has made perfect scores and won highest economy honors in some of the most grueling endurance and economy runs of the past year.

**SPECIAL NOTICE.** Our recently completed, big, modern, daylight Plant No. 2, has so increased our production that we are now entering new territory. If the Elgin Six is not now sold in your territory, better wire us for application blank and full particulars of 1917's best money making proposition for dealers.

**Elgin Motor Car Corporation, Chicago, U. S. A.**



*We Occupy this Entire Building—Finest and Handsomest Structure in the United States Devoted Exclusively to Wholesale Auto supplies and Hardware*

## Through Service We Succeed!

We are the fastest growing wholesale automobile accessory jobbing house in America—30,000 dealers know us favorably through having done business with us.

We were the first to inaugurate, and practice, on a national scale, our system of selling to merchants from our monthly catalog "SNAPS" known all over the country as "The National Bargain Directory of Automobile Supplies." Our system enables us to place before the accessory dealers of this country a *new fresh assortment of choice merchandise every 30 days.*

By mailing a complete catalog monthly, we keep the dealer in touch with the *latest and best* that the market affords. We do not have to anticipate a rise in prices in quoting you, and therefore, you have the advantage of the *lowest prices current* at any time.

We *buy* for cash and we *sell* for cash—therefore we are able, and do give you, the full benefit of the *lowest prices* at which our quality of goods can be bought. We are selling millions of dollars worth of auto supplies and hardware per year—therefore we can afford to take a very small profit on each item—*the big volume makes this possible.*

This business was founded with a small capital and a big idea—the idea of SERVICE. We have taken the meaning of SERVICE in its broadest sense. And each day, each month we have found a new and still broader meaning. And now we understand that SERVICE means all things that go to make life easier and business *more profitable for the dealers we serve.*

We guarantee to ship 90% of our orders within six hours from receipt. Only orders for unusual special items are occasionally held longer. *We guarantee to return your money to you at any time* that you ask for it—and it makes no difference whether you want it back for a good reason—or for no reason at all.

Send for  
FREE  
Copy of  
"SNAPS"

## We Sell Wholesale Only!

We only accept and fill orders from qualified dealers and garage men who buy to resell. No consumer order ever gets by our "Turn Down" department. We will not compete against our own customers and therefore *we protect the dealer absolutely.* From thousands of dealers we have earned the title of being their "Chicago Partner"—send for "SNAPS" the National Bargain Directory of Auto Supplies, be sure to use your letterhead and—

LET US BE YOUR "CHICAGO PARTNER"

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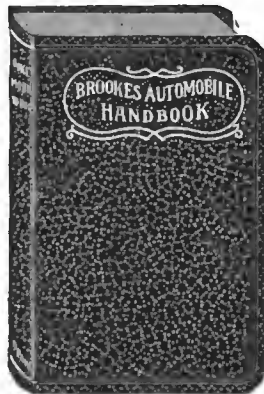
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**As a Work of Reference** BROOKES' AUTOMOBILE HANDBOOK has for years been without an equal. In this, the fifth edition, two hundred and eighty-one of the articles give their subjects complete encyclopedic treatment. One hundred and forty of the articles cover more than one full page; fifty-six being between two and five pages in length; thirty-four from five to ten pages and fourteen more covering up to twenty-one pages for the single article. Among those subjects receiving most extended treatment are found: Eight and Twelve-Cylinder Engines, Carburetor Principles, Engine Principles, Batteries, Oiling, Ignition Principles, also Gray & Davis, Westinghouse, Delco, Bosch, Eisemann and Remy electrical equipment. A study outline from the pages of the Handbook shows the following:  
**The Automobile Power Plant—Engine:** Construction and Operation of Two and Four-Cycle Types. Valves: Poppett, Knight Sleeve, Rotary and Disc. Four, Six, Eight and Twelve-Cylinder Types, Combustion Chamber, Flywheel, Mufflers, etc., Camshaft.

**As an Encyclopedia of Automobiles** BROOKES' is complete from every standpoint. In addition to authoritative treatment of all those subjects that might be called standard, the wide diversity of the field covered is shown by the following list of fifty headings selected throughout the work:

- |                                      |          |                  |                       |                       |                   |                     |             |   |               |             |                                   |              |                          |             |                |                          |                          |                              |                                 |                     |            |               |                        |                                 |                                     |                     |                                |                                       |                                  |                                |                                 |          |                     |                      |                        |                      |                            |              |              |                |             |                                   |                       |                   |           |                            |                  |                   |                |
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| Air, Relation of in Gasoline Mixture | Alcohol. | Aluminum Solder. | Ammeter Construction. | Anti-freeze Mixtures. | Assembling a Car. | Automobile Driving. | Backfiring. | Batteries, Starting and Lighting Types. | Bendix Drive. | Body Types. | Carburetor Adjustment (19 types). | Compression. | Compressed Air Starters. | Condensers. | Differentials. | Electric Apparatus Cars. | Electric Motor Troubles. | Engine, Knight Sleeve Valve. | Engine 8 and 12-Cylinder Types. | Expansion of Gases. | Flywheels. | Ford Magnets. | Fuels for Automobiles. | Gasoline, Explosions and Fires. | Gasoline, Thermodynamic Properties. | Heat of Combustion. | Ignition, Atwater Kent System. | Ignition, Connecticut Battery System. | Ignition, Delco Battery Systems. | Ignition Remy Battery Systems. | Ignition, Westinghouse Systems. | Inertia. | Kerosene as a Fuel. | Magnetic Gear Shift. | Magnetic Transmission. | Magnets (ten makes). | Offset Crankshaft Engines. | Picric Acid. | Preignition. | Rotary Engine. | Shop Kinks. | Starting and Lighting (16 makes). | Tire Care and Repair. | Tire Vulcanizing. | Traction. | Valves, Rotary, Disc, etc. | Valve Clearance. | Vacuum Fuel Feed. | Units of Heat. |
|--------------------------------------|----------|------------------|-----------------------|-----------------------|-------------------|---------------------|-------------|---|---------------|-------------|-----------------------------------|--------------|--------------------------|-------------|----------------|--------------------------|--------------------------|------------------------------|---------------------------------|---------------------|------------|---------------|------------------------|---------------------------------|-------------------------------------|---------------------|--------------------------------|---------------------------------------|----------------------------------|--------------------------------|---------------------------------|----------|---------------------|----------------------|------------------------|----------------------|----------------------------|--------------|--------------|----------------|-------------|-----------------------------------|-----------------------|-------------------|-----------|----------------------------|------------------|-------------------|----------------|

Brookes' Automobile Handbook adapts itself to your use, gives every advantage and service you ask. Its information is of lasting value, and the combination of reliability and unequalled service at such low cost makes its possession a real economy.

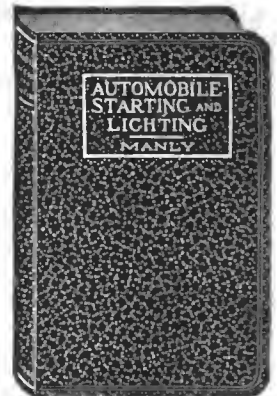
## Automobile Starting and Lighting

A Non-Technical Explanation of the Construction, Upkeep and Principles of Operation of the Electrical Equipment of Automobiles.

By H. P. MANLY

Pocket Size 302 Pages  
128 Illustrations

Leather Gold Stamping  
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**AUTOMOBILE STARTING AND LIGHTING** is a book designed for the electrical worker, whether expert or novice. The principles used from the very beginning, as well as those found for the first time in 1916, have been covered in detail, and the examples given are from the applications of these principles to the starting and lighting equipment of cars.

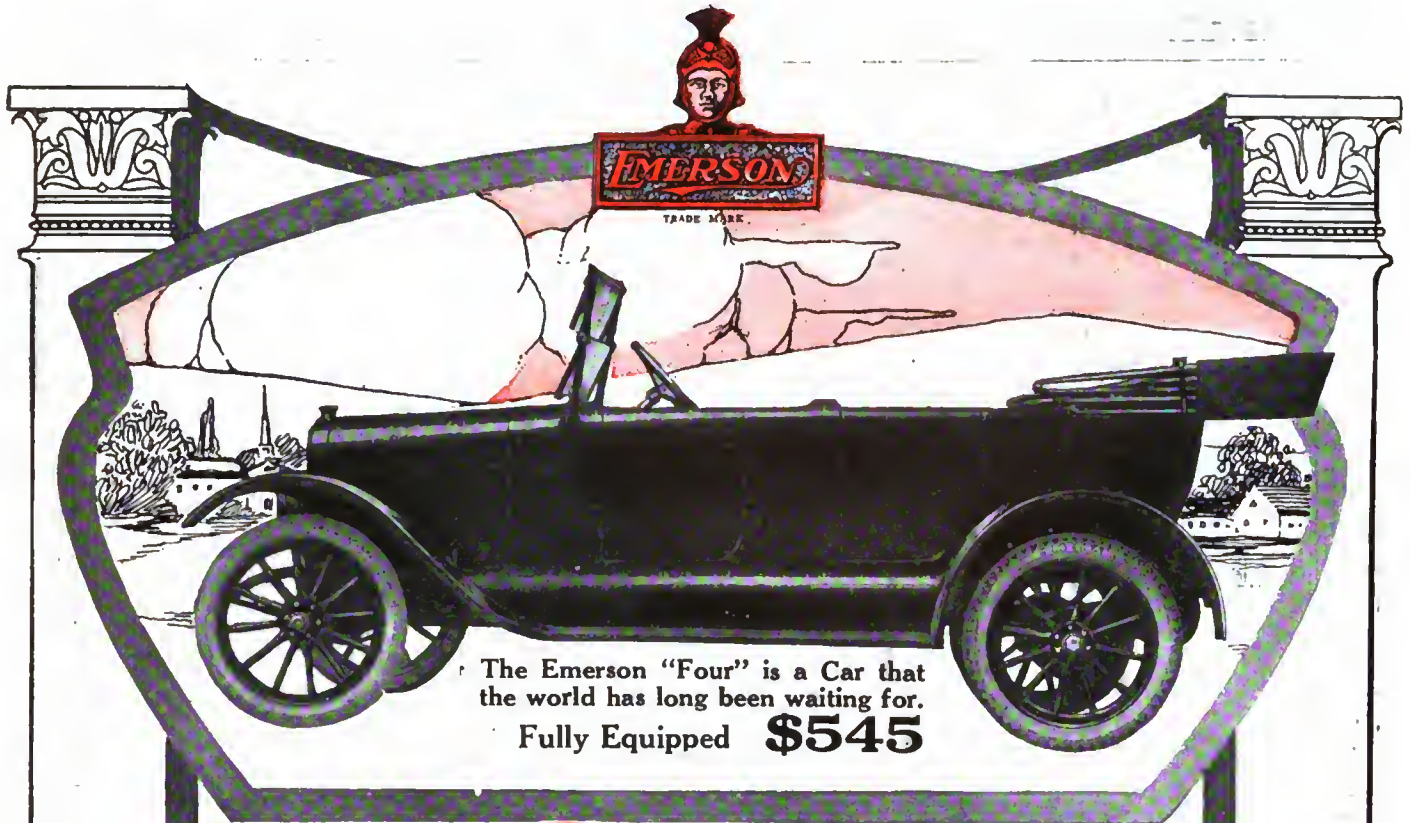
The result is a textbook of practical information, from which every unnecessary sentence has been eliminated by the arrangement adopted, yet which covers in detail all of the distinctive parts entering into twenty-four different makes of equipment now in use. An examination of the index with its three hundred and fifty references shows the following headings:

- |                |              |               |              |
|----------------|--------------|---------------|--------------|
| Adlake         | Deaco        | Jesco         | Splitdorf    |
| Allis-Chalmers | Delco        | Leeco-Neville | U. S. L.     |
| Apico          | Disco        | North East    | Vesta        |
| Auto-Lite      | Dyneto       | Remy          | Wagner       |
| Bijur          | Entz         | Rushmore      | Ward Leonard |
| Boech          | Gray & Davis | Slimms-Huff   | Westinghouse |

The three hundred and two pages have been divided into nine chapters, each chapter treating of some one part of this work. The logical arrangement and completeness of the whole book is best realized by an examination of the following brief outlines of these chapters.

- Chapter I. Electric Lighting and Engine-Starting Equipment.** Requirements. The Charging System. The Lighting System. The Starting System. Types, Uses and Constructions of the Parts.
- Chapter II. Lighting Dynamos and Starting Motors.** The Operation. Construction. Upkeep. Care and Repair of the Current Generating and Starting Units. Dynamos: shunt, series, compound and reversed series windings. Armatures, brushes, fields, two-, four- and six-pole machines, output control, size and capacity. Starting Motors. Motor-dynamos. Ignition-dynamos. Double-deck Units.
- Chapter III. Batteries.** Action during charge and discharge. Charge and discharge rates. Charging methods. The Cell. Electrolyte. Plates: forming, paste, grids, etc. Capacity and Efficiency. Care, testing, voltage, etc. Troubles and Remedies.
- Chapter IV. Lamps and Wiring.** Uses of the Various Types of Bulbs, Reflectors, etc. Focusing and Cleaning. Dimming Methods. Single, Double and Three-Wire Systems. Switches. Fuses. Circuit Breakers. Distribution Panels, Junctions, Voltage, candlepower and amperage.
- Chapter V. Control Parts.** Cut-outs: electro-magnetic, hand and centrifugal. Tests and adjustment instructions for all types. Constructional details of various types and makes. Care and Repair. Output Regulation. Amperage Control or Constant Voltage. Characteristics of Each Class. Adjustments. Troubles and Remedies. Applications: constant voltage, constant speed, inherent methods, ampere-hour meter, bucking coils, altered field connections, by battery voltage, carbon resistance, compound windings, iron wire system, line resistance, mercury wall, reversed series, third brush, vibrator systems.
- Chapter VI. Drive Methods and Starting Switches.** Single and Double Reduction. Ratio Required. Over-running clutch. Bendix Drive. Bushmore system. Magnetic switches. Magnetic gear shifts. Automatic and Planetary Gearing. Single and Double Contact Switches. Resistance Types, Commutating Switches. Motor Brush Switch. Motor-dynamo Switches.
- Chapter VII. Troubles and Remedies.** Systematic Methods of Location. Classification of Faults. Testing. Lighting, Charging and Starting Troubles. Regulation and Cut-out troubles. Indicating Devices. Ammeters, voltmeters, voltmeters, indicators. Target. Pilot Lamps.
- Chapter VIII. Makes and Types of Equipment.** Auto-Lite, Dyneto and Entz, Gray & Davis, Remy, Delco, Disco, Westinghouse, North East, U. S. L., Bijur, Wagner, Bosch and Rushmore, Splitdorf, Slimms-Huff, and Allis-Chalmers.
- Chapter IX. Explanation of Two Hundred Words and Terms Used in Starting, Lighting, Ignition and Electrical Repairing.**

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The Emerson "Four" is a Car that  
the world has long been waiting for.  
Fully Equipped **\$545**

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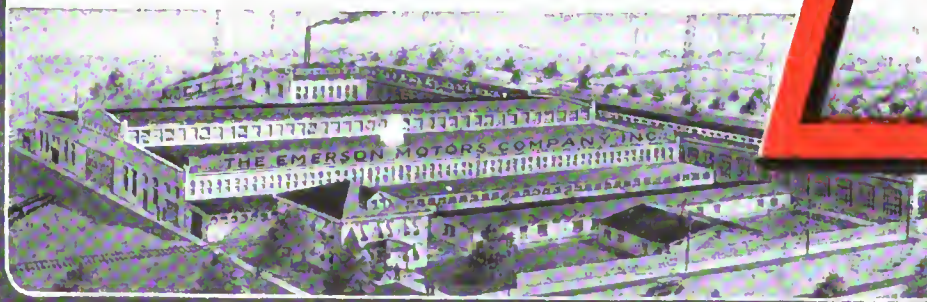
**The Lowest-Priced 5-Passenger 110-  
inch Wheelbase Car in the World**

—at the same time Comfortable, Good-Looking and  
Soundly Constructed.

The EMERSON "FOUR" is a Car that the world has  
long been waiting for. It fills the gap where the demand  
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# GUARANTEEING OUR SUCCESS—AND YOURS



**G**OODYEAR products would have an even break on the open market if they were merely as good as the average.

But we believe that no manufacturing concern could start at the bottom, as we started, and go to the top, as we have gone, except by putting out goods that stand head and shoulders above all others.

Temporarily, we could save a lot of money by skimping Goodyear Tires—skimping on quantity of rubber and quality, cutting out our extra plies of fabric, by doing away with our tremendous experimental department, by eliminating the On-Air Cure and by saving in a hundred and one other directions.

But doing these things would make Goodyear Tires no better than others and would stop the upward rush of Goodyear sales—as soon as the public found out that our standard had been lowered.

So we shall continue to do all the expensive

things that give Goodyear Tires their extraordinary virtues—because doing these things guarantees the *permanent and unbounded success* of Goodyear and of Goodyear Service Stations.

The Goodyear Tire & Rubber Co.  
Akron, Ohio

**GOOD YEAR**  
AKRON



**Every  
Ounce of  
Energy**

**From  
Every  
Drop of  
Fuel!**

**R**EGARDLESS of the MAKE of car—of the KIND of going or STATE of weather—the New Stromberg Carburetor extracts every ounce of energy from every drop of fuel. Every ounce of gas strength is converted into **USABLE DRIVING FORCE**—creating

***Maximum Speed—Quickest Starting—Best Acceleration  
at a Minimum of Fuel Consumption and Cost***

Records established by the New Stromberg Carburetor in development of "get through" running power—from coast to coast—over rocky, rutty highways—gripping gumbo and speed-stalling sand roads—up the steep, rugged Rockies—through blistering heat—through banked-up snow with mercury hovering at zero—**PROVE** the invincible action of operation—and its true worth to every car owner.

Send for full particulars and copies of economy records. They are free. Give name, model and year of your car.

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Dept. 218, 64 E. 25th Street, Chicago, Ill.

**New STROMBERG Does it!  
CARBURETOR**

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The Peerless Dealer's Big Advantage

# Two Power Ranges

Extravagant Performance With Economical Operation



*All that the name implies*

**N**O longer need men forego—for reasons of economy—the pleasure of owning a big super-powerful car of the utmost class and distinction.

For the Peerless Eight has power and speed in rare abundance without the expense it formerly took to operate the super-powerful cars in ordinary driving.



In its "loafing" range the Peerless Eight gives that quiet, smooth, flexible, distinctive performance which one would expect of a car of real class.

## A "Loafing" Range

But in this "loafing" range it is operating on half rations—consuming fuel so sparingly as to put many a lesser powered six to shame, even many a four.



And when one wants or needs super-power or emergency speed, it's there in the same Peerless Eight which serves one's ordinary requirements with such grace, distinction and economy.

## A "Sporting" Range

Open the throttle wider to release the double poppets and give her full fuel rations and the whole character of the car is utterly changed.

For in her "sporting" range she is a brute of a car capable of a brush with any contender no matter what its class.



The Peerless dealer has a big advantage in a car that is different and better—one that demonstrates to such advantage as to completely win the prospective buyer.

The Peerless Motor Car Co., Cleveland, Ohio

*Prices f. o. b. Cleveland—Subject to Change Without Notice.*

On orders accepted by the factory for shipment until February 28, 1917

Touring	- - -	\$1890
Roadster	- - -	\$1890
Sporting Roadster	- - -	\$2250
Coupe	- - -	\$2700
Sedan	- - -	\$2750
Limousine	- - -	\$3260

On orders accepted by the factory for shipment after February 28, 1917

Touring	- - -	\$1980
Roadster	- - -	\$1980
Sporting Roadster	- - -	\$2250
Coupe	- - -	\$2700
Sedan	- - -	\$2840
Limousine	- - -	\$3350



# Peerless Eight

Please mention The Automobile when writing to Advertisers

# Electric Auto-Lite

STARTING - LIGHTING - IGNITION

## The Significance of Auto-Lite Bigness

Bigness in itself means nothing.

But bigness **made necessary** by a tremendously increasing **demand** for an unusually efficient product is of the utmost significance.

Such is Auto-Lite bigness—a bigness attained through **steady growth**—a bigness **compelled** by demand—a bigness produced by the **success** of Auto-Lite systems on hundreds of thousands of cars the world over.

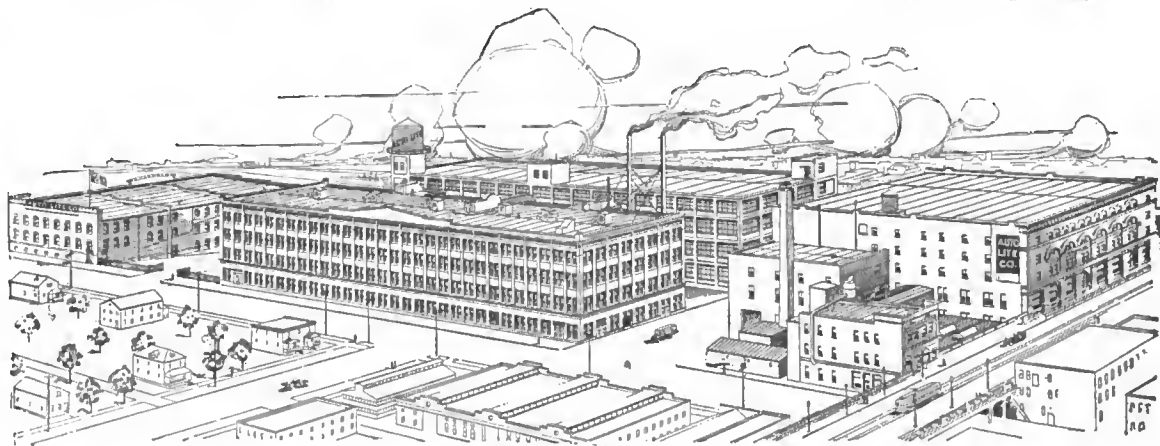
We have the largest factory in the world devoted exclusively to the making of starting, lighting and ignition systems for motor cars.

Such bigness we call to your attention—for it is the material symbol of a tremendous world wide "good will."

### The Electric Auto-Lite Co.

Head Office and Factory  
Toledo - - - - Ohio

Detroit Sales Office  
1507 Kresge Bldg.



Home of the Electric Auto-Lite Company

These buildings, of the most modern construction, contain approximately 422,000 square feet of floor space. They are equipped with the most approved modern machinery and are turning out 1400 complete starting and lighting systems every day.

## In Sales and Action— A Climber

# STANDARD

The Magneto Equipped "Eight"

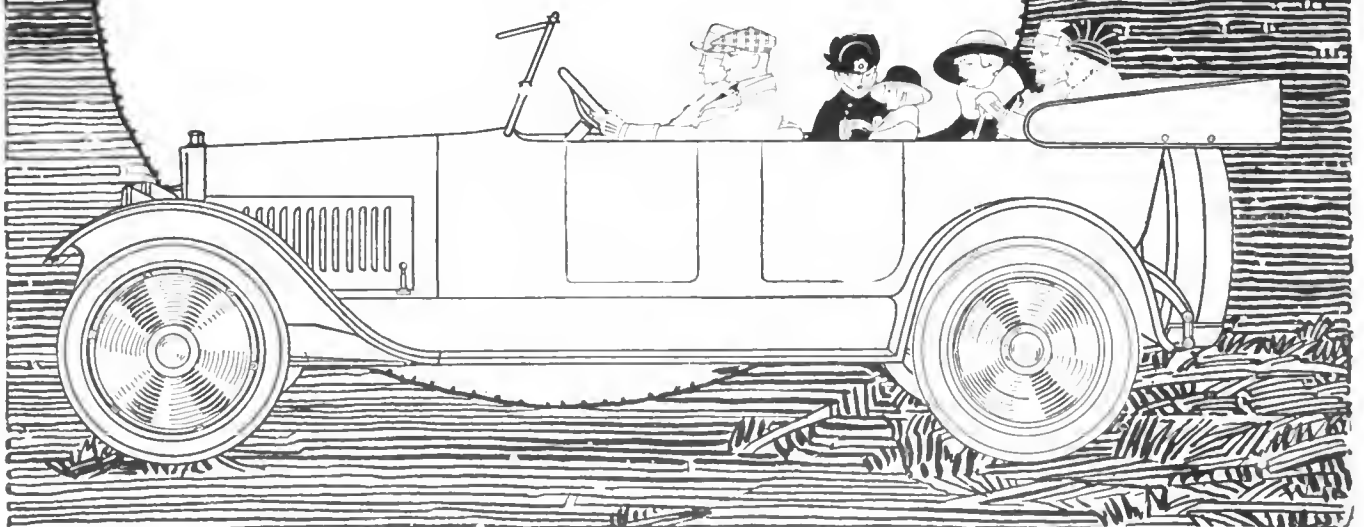
A great performer—in standing up victoriously under the brunt of both competition and traffic.

No car ever went on the market when competition was hotter. No car ever established itself quicker in the heart of public confidence.

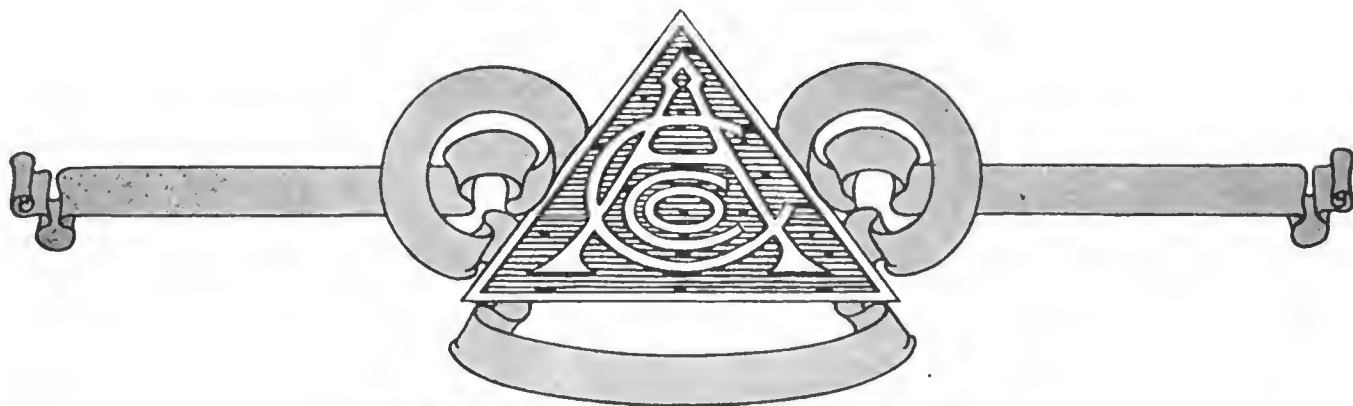
The Standard "8" is a winner because of sheer merit. Built by past-masters of steel and stress, with an 80 H. P. cataract of might always at your command.

Fine territories now open for the right dealers. Write today for Standard "8" Selling Plan.

**STANDARD STEEL CAR COMPANY**  
Pittsburgh, Pa.



Please mention The Automobile when writing to Advertisers



*Proved*

**G**UESSWORK has no place in the building of Columbia Axles. The materials used are chosen with a mathematical certainty of performing the functions for which they are intended. The design—the methods of construction—have been proved in the crucible of actual use.



Three-quarter floating-type construction—bevel gears that are noiseless and most highly efficient—unusually large and powerful brakes—all contribute to the success of Columbia Axles. That trouble-free service should be enjoyed by every user of a car equipped with them is a logical result. We will gladly send you full information on request.

**THE COLUMBIA AXLE COMPANY, CLEVELAND, OHIO**



**COLUMBIA  
AXLES**

Please mention The Automobile when writing to Advertisers

# Motor Car Perfection

will come when  
every working  
part gives the  
same Care-free  
Service you  
now find in



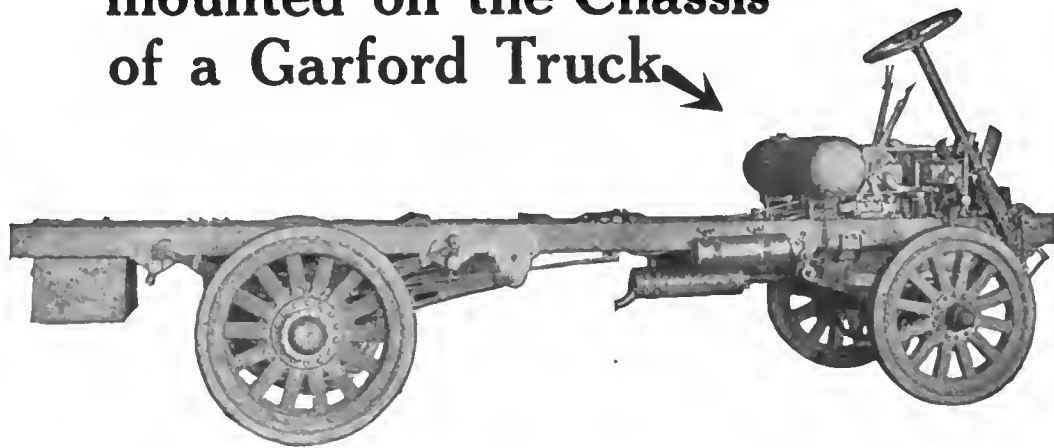
**HYATT**  
QUIET  
BEARINGS

Please mention *The Automobile* when writing to Advertisers

Here is the

# “JASCO” TANK

mounted on the Chassis  
of a Garford Truck



The “Jasco” Tank is used and indorsed by the following prominent manufacturers:

**PLEASURE CARS**

Biddle Motor Car Company, Simplex Automobile Company, Mercer Automobile Company, Lozier Motor Company, Stanley Motor Carriage Company, James Cunningham Son & Company, Murray Motor Car Co.

**TRUCKS**

Baldwin Locomotive Works, Antocar Company, General Vehicle Company, H. G. Burford Company, Peerless Motor Car Company, Garford Motor Truck Co.

**MOTOR BOATS AND NAVAL ARCHITECTS**

William H. Hand, Jr., Mathis Yacht Building Company, Gas Engine & Power Company.

The quality of the Garford product is well known—its prestige is firmly established in every quarter where consideration is given the motor truck.

It is consistent with the Garford’s policy of “the best for every customer” that the famous “Jasco” Tank is a part of its regular equipment. It thus gives a purchaser a gasoline receptacle that protects life and property and insures the use of every drop of fuel.

The “Jasco” Tank is seamless, tinned and tested; it is made of the finest quality drawn steel and it positively cannot leak.

Look carefully at that car you intend purchasing—if you find a “Jasco” Tank as part of the standard equipment you’ll know beyond question that the manufacturer is building his product on a consistent quality basis.

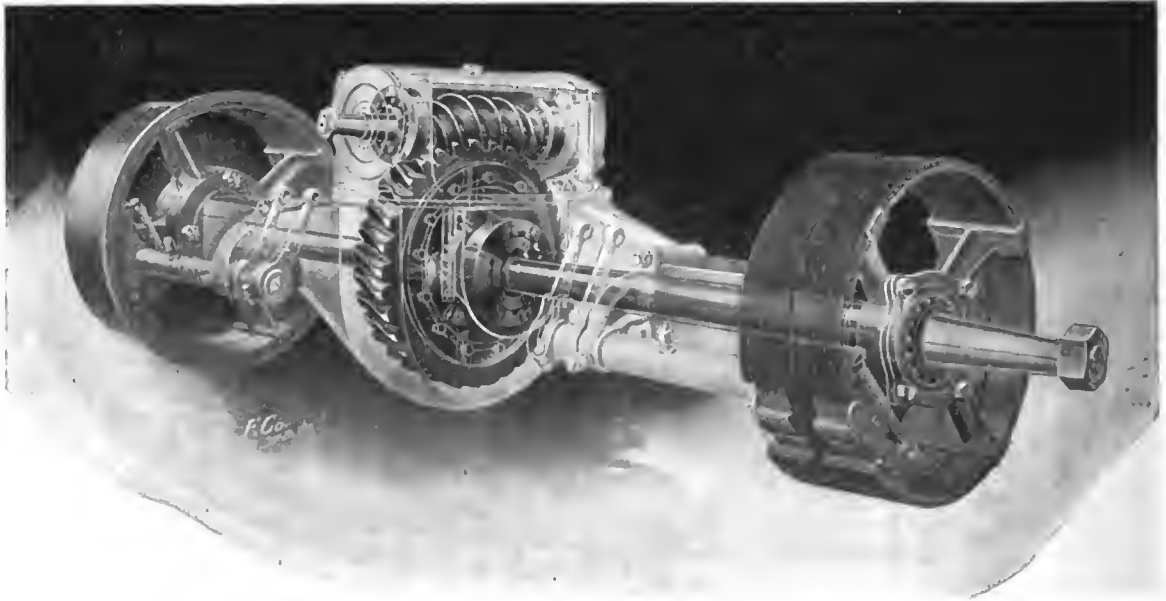


**JANNEY, STEINMETZ & CO.**

Main Office: PHILADELPHIA  
New York Office: Hudson Terminal Building

Please mention The Automobile when writing to Advertisers





# SHELDON

## Semi-Floating Worm Gear Axles Are SOUND Axles

SOUND in design because they are simple.

SOUND in construction because of the high quality of their materials.

SOUND in performance because they are built to stand up under the rack and grind of heavy duty truck service.

“The highest priced axles in the world, and worth all they cost.”

### Sheldon Axle and Spring Company

Wilkes-Barre, Pa.

WINNER OF GOLD MEDAL AT PANAMA-PACIFIC INTERNATIONAL EXPOSITION



The advertisement is a black and white illustration. At the top, the word "GURNEY" is written in large, bold, block letters. Below the text, a vintage automobile is shown in profile, parked on a road. In the background, there are trees and a building with an archway. In the foreground, a large, detailed illustration of a ball bearing is shown, highlighting its curved surface and the inner raceway. To the right of the bearing, there is a block of text explaining the technical advantages of the bearing. At the bottom right, the company name and locations are listed.

There is a definite reason for the unusual capacity of Gurney Ball Bearings. It lies in the unequalled exactness and accuracy of race contour. The highly developed machinery of the Gurney plant permits a closer following of the curvature of the balls by the curve of the raceway. This secures a rapid increase in the contact area between raceway and ball as the balls spring or yield to the increasing pressure, permitting a better distribution of load. The accuracy of the machine work insures minimum friction.

**GURNEY BALL BEARING COMPANY**

Conrad Patent Licensees

JAMESTOWN, N. Y.

Chicago, Ill.

New York City

Please mention The Automobile when writing to Advertisers

# Where All of 'em Count

*The strong points of the Ferro V-Type Engine are strong points—not just talking points*

*And the Engine Proves It!*

Performance records from all over make it plain that the advantages of this Ferro V-Type aren't just theoretical, by any means. Here, for example, is Mr. W. E. Mallory, President of the Jackson Motor Car Co., of Missouri, saying:

*Three out of forty*

"In the automobile dealers' endurance run out of Kansas City, between 700 and 800 miles, we went through with a perfect score. About 40 cars were entered, and three made perfect. The engine never failed to work perfectly at all times during the entire trip."

*Not the least trouble*

"Mr. Troup, one of our traveling representatives, has driven eight or ten thousand miles and has not had the least trouble."

*Everybody's happy*

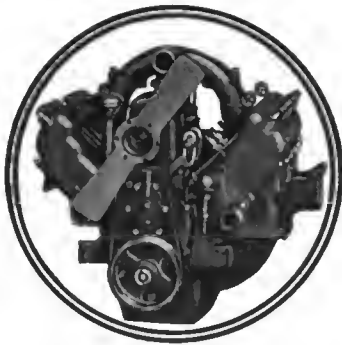
"We are pleased to say that none of our customers owning the new Wolverine Eight, equipped with Ferro V-Type Engines, has anything but good to say of them."

*Why? Look at the pictures*

They show four—not all—of the strong points of the engine—but you can get the whole story from a well illustrated booklet that we'll be glad to send you for the asking.

Here's something big. Get *all* the facts.

THE FERRO MACHINE & FOUNDRY COMPANY  
293 Hubbard Avenue Cleveland, O.



This engine has individual valve-cams—giving a firing order directly across from one bloc to the other—two impulses on same elbow. No torque, no twist.



Overhead valves without cages; detachable cylinder-head. Greatly increased power. Valve-adjustment a 10-minute job.



Intake manifold in a jacket of water at outlet temperature. Gas kept at a constant temperature that insures quick vaporizing.



Completely-machined, cylindrical combustion chambers—no pockets or roughnesses. Pistons over-travel in counter-boring, preventing carbon on cylinder barrels. Rapid and complete combustion—maximum power and flexibility.



Please mention The Automobile when writing to Advertisers



There is  
More Power in  
**THAT GOOD GULF**  
**GASOLINE**  
and  
**SUPREME**  
**AUTO OIL**

***COLD ? Yes! But***  
**NO OIL TROUBLES**

**SUPREME AUTO OIL**

**Flows Freely at Zero—Starts With the Engine**

No possibility of scored cylinders when you use such an oil.

SUPREME AUTO OIL is manufactured from Southern Asphalt Base Crude, containing no paraffine to gum and stick.

This affords better facilities for quick starting.

Dealers should write us.

**GULF REFINING COMPANY**

*The Largest Independent Refining Company in the World*

General Sales Offices: Pittsburgh, Pa.

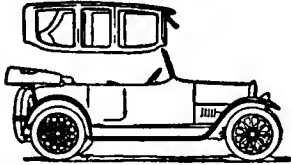
District Sales Offices:

New York Philadelphia Boston Atlanta Tampa New Orleans Houston

Please mention The Automobile when writing to Advertisers

# KISSELKAR *The* ALL-YEAR Car

*Kissel's Original Idea That  
Changed the Motoring  
Habits of a Nation*



*The  
Hundred Point  
Six*

The car of a Hundred Quality Features. Its Kissel-built, under-the-surface details, the parts-next-to-the-road, insure that staunchness, plus light weight, that gives 100% motoring efficiency.

THE business man who purchases his motor car with the same care he exercises in buying his stock and bonds *inevitably* decides on the ALL-YEAR Car.

He finds that the ALL-YEAR Car in *appearance, comfort and performance* is that of a permanently enclosed coach.

He appreciates the fact that the ALL-YEAR Top is *built-in*—not on—that it is found on no other car but the KisselKar and is *entirely removable*, giving him in Spring a wide-open, roomy touring car with no roof to intercept his view.

Apply business principles in the purchase of *your* car.

DEALERS—Every month pays dividends to Kissel-Kar dealers. Write or wire us *today* for particulars regarding open territory where the *demand* for Kissel's ALL-YEAR Car insures a *twelve-months selling season*.

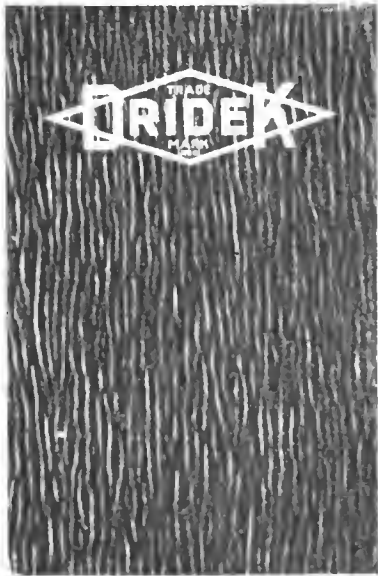
KISSEL MOTOR CAR COMPANY  
Hartford, Wis., U. S. A.



Please mention The Automobile when writing to Advertisers



## A Remarkable Covering for Automobile Tops



DrideK is a product manufactured expressly to withstand the hardest kind of service and yet retain its appearance and be everlastingly waterproof.

We emphatically repeat the statement that DrideK makes a remarkable automobile top.

Right now is the time to get samples and prices—as we know that DrideK will command your attention as soon as you see it.

### L. J. MUTTY COMPANY

*Manufacturers of Bull Dog Fabrics*

**BOSTON, MASS.**



How much longer are you going to do without Bakelite, the heat-resisting moulded insulation that is also hard, and strong physically as well as electrically?

Send for Booklet  
**BAKELITE**  
ON THE AUTOMOBILE

# BAKELITE

is just the material you need for those pieces that are exposed to heat, to splashing oil, to shocks and jars, or to corrosive influences.

Bakelite is chemically inert; it is lighter than die castings; stronger and far more heat-resistant than hard rubber; or any of the shellac and resinous substances.

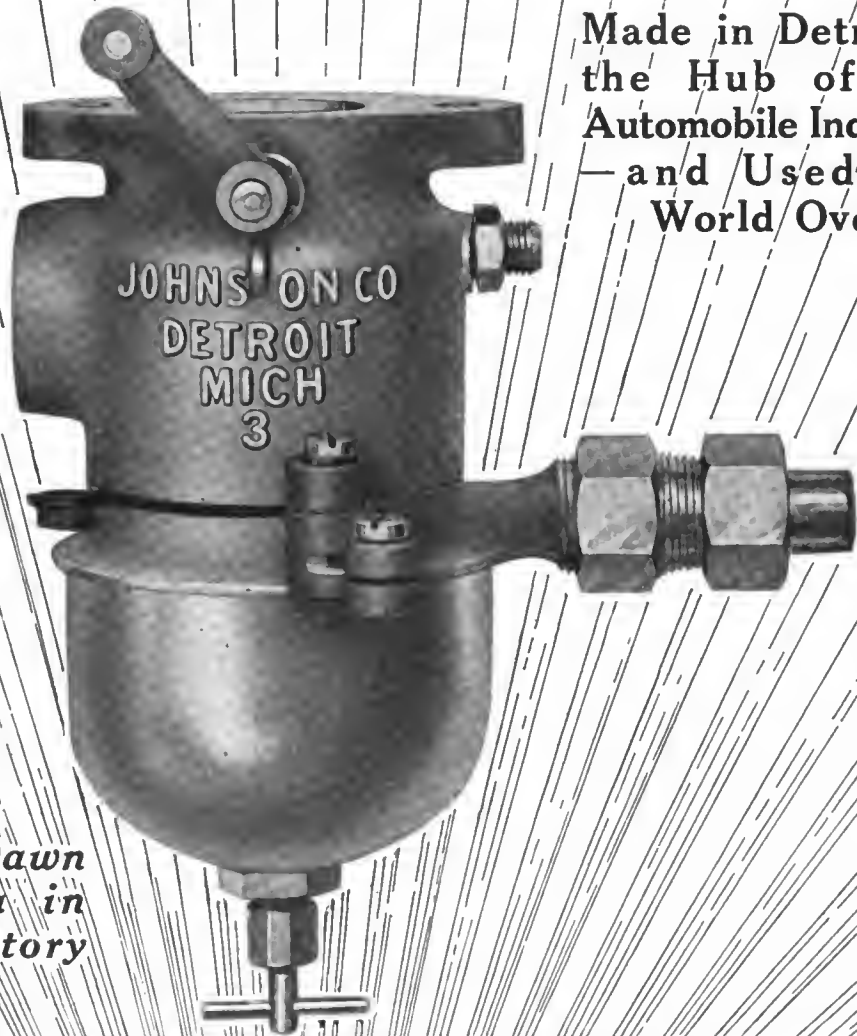
It is finished as it comes from the die—thus saving expense.

When metal inserts are required, there's no material that excels Bakelite; the metal parts are moulded in, accurately positioned, the cost of assembling is saved for there's no drilling, tapping or fitting.

**GENERAL BAKELITE COMPANY**  
**2 RECTOR STREET, NEW YORK**

# JOHNSON CARBURETOR

Made in Detroit—  
the Hub of the  
Automobile Industry  
—and Used the  
World Over



*It Marks the Dawn  
of a New Era in  
Carburetion History*

**JOHNSON COMPANY**  
Makers of Superfine Instruments  
of Carburetion  
Detroit, Michigan

Please mention The Automobile when writing to Advertisers



# SUNDERMAN **\$5**

## Vacuum Carburetor

\$6.50 with elbow for attachment to engine where manifold is not cast in head. (Ford and Metz cars do not need elbow.)

## ECONOMY

From the very nature of its mixing principle the Sunderman Vacuum Carburetor must secure fuel economy.

The suction of the cylinders, according to speed, draws gasoline from either or both the low and high speed jets. Automatically, as it inhales this gasoline, it opens the air intake and draws in a whirling draft that meets the incoming gasoline at right angles.

It dashes it against the V-screen, and by the irresistible force of the air cuts every minute bubble of gasoline into infinitely fine particles, resulting in a mixture that is GAS before it leaves the mixing chamber.

### Now, mark this well

It makes no difference whether your fuel is high or low grade gasoline, kerosene or distillate—this mode of mixing saves a big percentage of it.

### Let us show you how

The ordinary mixture that enters a combustion chamber is exploded in part only—the remainder just burns—

and carbonizes. Thus the power impulse received is WEAKER than if ALL the mixture exploded. To secure a given requirement of power you must, therefore, use more gasoline. Isn't that simple arithmetic? To say nothing of the reduction of power that comes from the increase of carbon deposit.

### The Sunderman mixture is all gas

pure, dry and light, and all of it explodes the INSTANT it reaches the combustion chamber, thus giving to the piston all the power that is contained in exploding gasoline. Carbon, therefore, is almost impossible, and it needs only common sense to see that from a given amount of gasoline more power is secured with a Sunderman Carburetor, and therefore less gasoline is used to drive the car for a given distance or at a given speed.

That is a simple and logical demonstration of economy, isn't it?

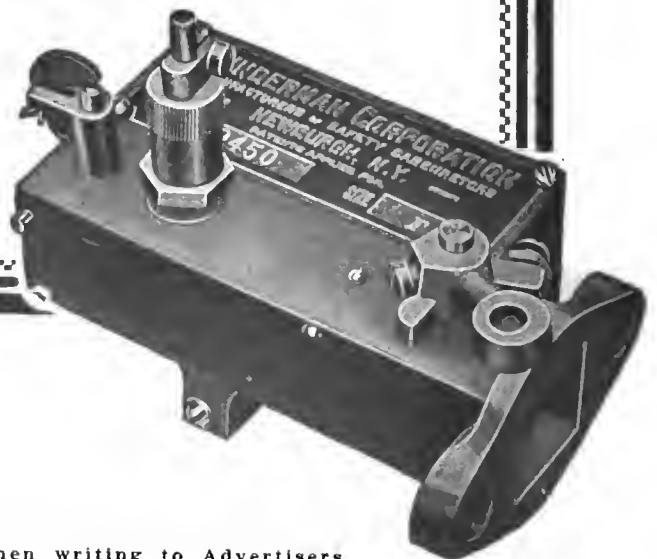
Then let the carburetor prove itself to you.

Good Territory Open—Dealers, Write Now

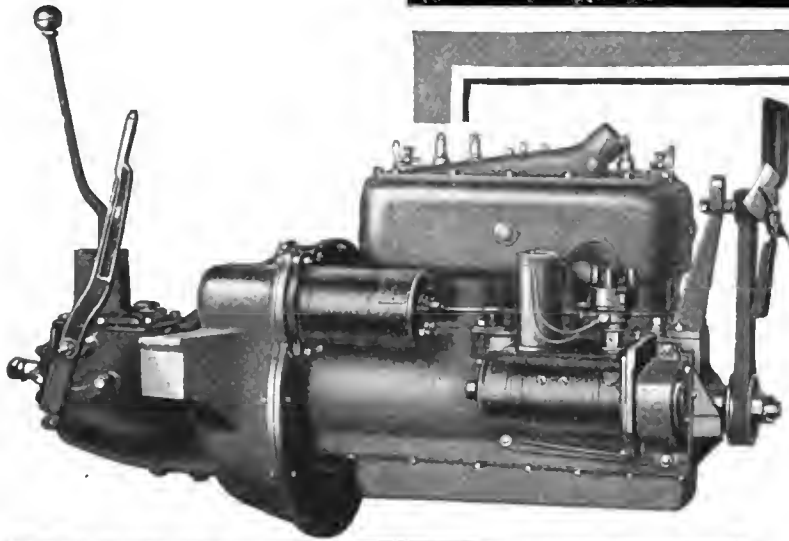
## Sunderman Corporation

5 Chambers Street  
Newburgh, N. Y.

Western Sales Offices: 403 Kresge Bldg.,  
Detroit



Please mention The Automobile when writing to Advertisers



Four Cylinders,  $3\frac{3}{4} \times 4\frac{1}{4}$  ( $22\frac{1}{2}$  H.P., A.L.A.M.) 36.9 H.P. at 2800 r.p.m. Three bearings. All G. B. & S. Motors now provide for two-unit starting and lighting system only—operating through Bendix Drive.

## Concentration—a Bond to Quality

The minute an engineer takes the time to investigate a G. B. & S. Motor and give it a real test, under trying conditions, that instant we begin to make a convert to the G. B. & S. idea.

And by the same token, the buyer who drives a "G. B. & S." Motor instantly appreciates the various distinctive advantages that result from concentration on one model.

He finds that though this motor is rated at  $22\frac{1}{2}$  H.P., it develops 36.9 horse-power.

Thus he has a flexibility of operation and range of speed at his command unique in four-cylinder motor.

He is impressed by the rugged design and the marked simplicity. He is pleased with the economy. He likes the accessibility of every part. He likes the easy method of adjusting the chains, insuring silence.

And he is delighted with the snap, verve and **powerfulness** of what he enthusiastically acknowledges is one of the best four-cylinder motors ever built.

By concentrating all our energies on this one type of motor, we virtually bind ourselves to produce a superior article—there is no other alternative. We accept the situation as it is and we leave it to "G. B. & S." users (increasing every season) to say whether or not we are delivering the goods.

*For blue-prints and other information, write*

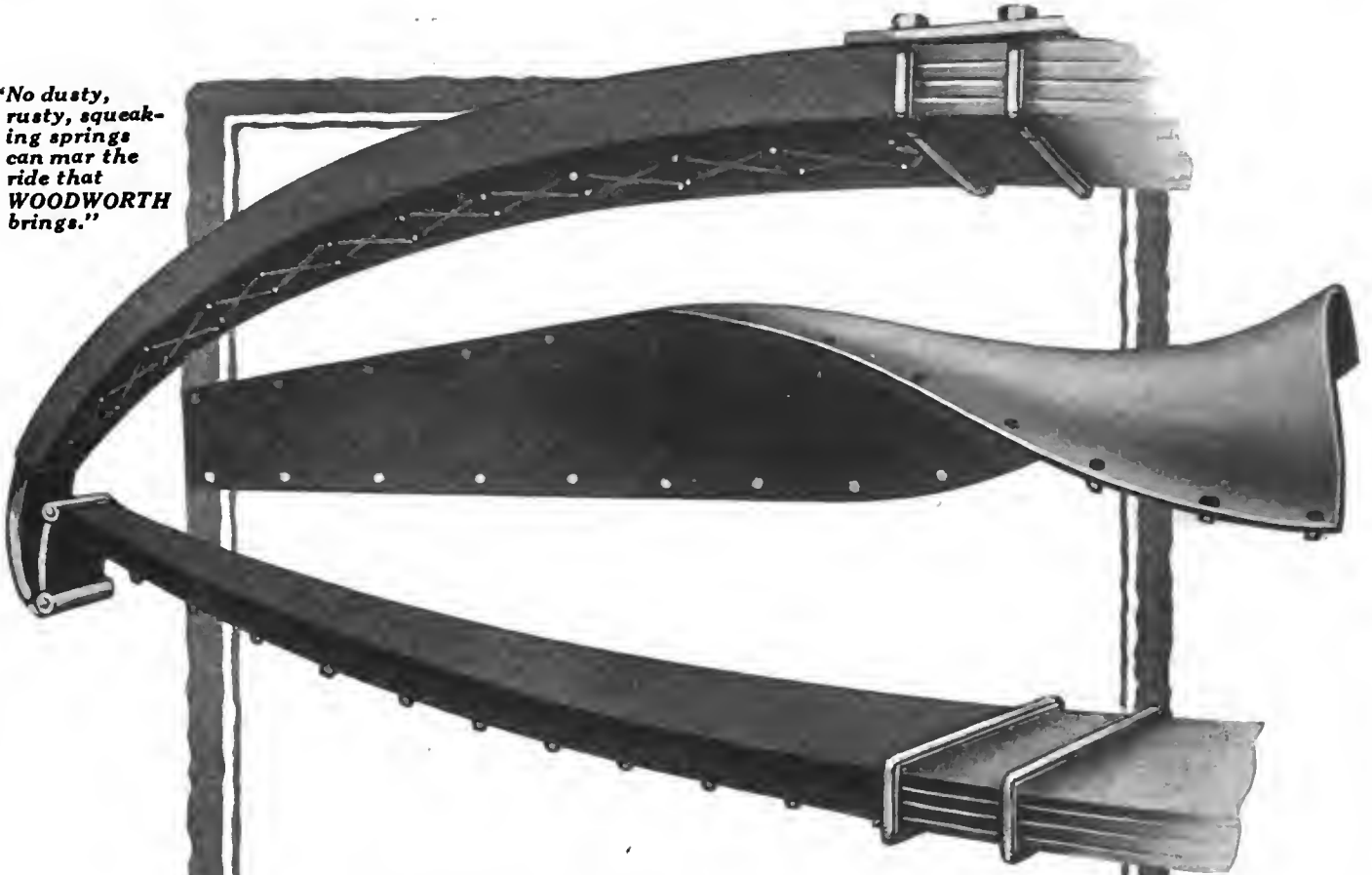
**GOLDEN, BELKNAP &  
SWARTZ COMPANY**

DETROIT, MICHIGAN

# G. B. & S. motors

Please mention The Automobile when writing to Advertisers

"No dusty,  
rusty, squeak-  
ing springs  
can mar the  
ride that  
**WOODWORTH**  
brings."



## WOODWORTH Spring Cover & Lubricator

A LEATHER COVER (AS SHOWN) that laces over the spring, entirely enclosing it and protecting it from dust and moisture.

LINED WITH OIL-SATURATED FELT WICKING, it eliminates rust and keeps the spring properly lubricated and in good working order.

CONTAINS SUFFICIENT OIL TO LAST a year without renewal.

EASILY AND QUICKLY PUT ON, these covers present a very neat, pleasing appearance.

WILL FIT ANY MAKE OF CAR.

NOT ONLY MAKE A CAR MORE COMFORTABLE to ride in, but prevent its becoming a noisy, humiliating rattletrap.

COST BUT LITTLE and save you money and discomfort.

ASK YOUR JOBBER.

### PRICES

Sizes	Genuine Leather	Imitation Leather
12 in. or less...	\$0.65	\$0.30
12-14 in.....	.90	.40
14-16 in.....	1.10	.50
16-18 in.....	1.30	.60
18-20 in.....	1.50	.70
20-22 in.....	1.70	.80
22-24 in.....	1.90	.90
Over 24 in.....	2.00	1.00

### WOODWORTH MANUFACTURING CORPORATION

NIAGARA FALLS, NEW YORK

CANADIAN FACTORY, NIAGARA FALLS, ONTARIO

Please mention The Automobile when writing to Advertisers

# POSITIVENESS



Every Speedway Record Made During the Past Five or Six Years Is a Bosch Magneto Record. Too — of Course

## The Sense of Certainty

which Bosch Magneto Ignition inspires in the world's greatest racing drivers—they all use Bosch—is in itself a guarantee that you will have efficiency and reliability at that most vital point of your car, the ignition system. It is advisable, therefore, in fact essential to your peace of mind, that the car you buy, whether low priced or expensive, be Bosch-Equipt.

You serve yourself best, you invest well when you insist upon Bosch.

**SPECIFY BOSCH**

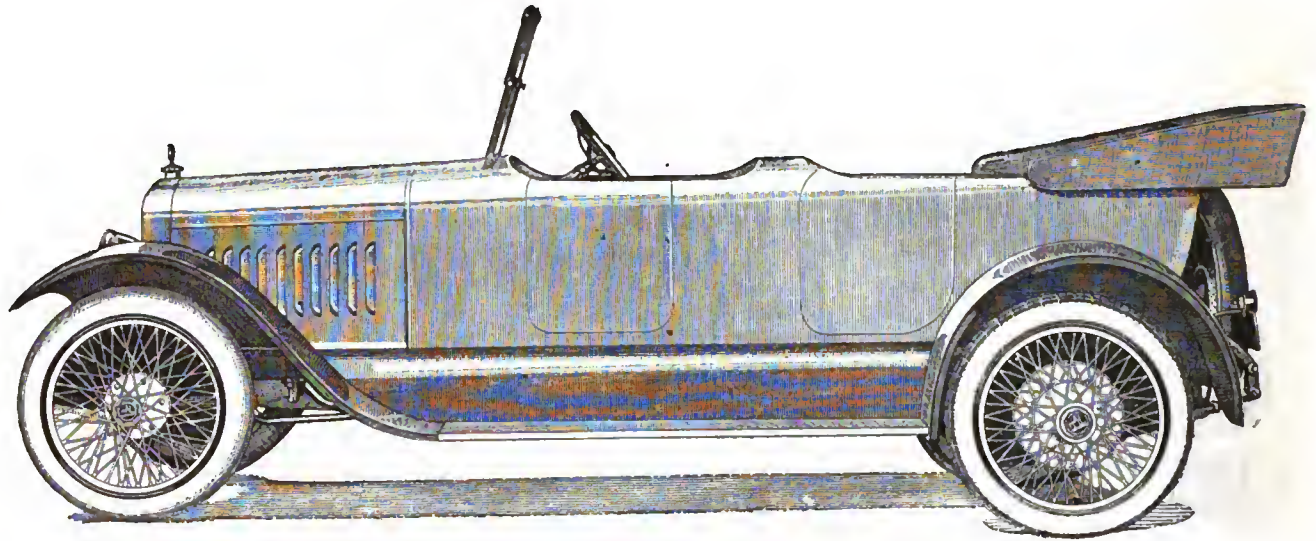
It will be a pleasure to send you a catalogue.

## SPECIFY BOSCH AND BE SATISFIED


**Bosch Magneto Company, 220 West 46th Street, New York**

**SERVICE STATIONS IN EVERY STATE**

Please mention *The Automobile* when writing to Advertisers



# The Hal Twelve


 Something more than power; something more than smoothness; something more than economy—a combination of all. Such is the Hal valve-in-head twelve motor. It develops 87 horse power at 3000 revolutions per minute, is gentle and gives 10 to 13 miles to a gallon of fuel. Seven-Passenger Touring Car or Roadster, \$2600. Limousine or Town Car, \$4500, Leon Rubay Creations. Touring Sedan, \$3500. Cleveland Prices.

Hal Motor Car Company, Cleveland, Ohio

Please mention The Automobile when writing to Advertisers

Prest-O-Lite  
**Prest-O-Lite**  
**SERVICE**  
**in DETROIT**



*Illustrations above show, (top) front view of Prest-O-Lite Factory Branch at 1239 Woodward Ave., Detroit; (below) the large space devoted to battery inspection and service.*

*Views above show, (top) commodious office space of the Detroit Branch; (below) large quarters occupied by the battery charging and repair department.*

**I**N Detroit, fifth city of America, the automobile metropolis of the world, where the influence of the motor car is far-reaching and SERVICE is a paramount issue—there you will find a big Prest-O-Lite Factory Branch, with a live, hustling organization giving real factory service to manufacturers, dealers and car owners in Detroit and Eastern Michigan.

Detroit is but one link in the great chain of Prest-O-Lite Direct Factory

Branches and Service Stations. The Prest-O-Lite network of service literally covers the country, insuring full satisfaction and hearty co-operation to owners, dealers and manufacturers in the use of Prest-O-Lite products.

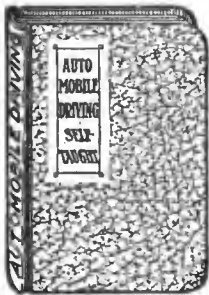
Thousands of dealers are finding the Prest-O-Lite Battery proposition a source of substantial profit. Write today for details.

The Prest-O-Lite Co., Inc., U. S. Main Office and Factory, 900 Speedway, Indianapolis, Indiana  
 Canadian Main Office and Factory, Merrittton, Ontario, Canada

***The Prest-O-Lite battery is a better battery--backed by a better service***



# MECHANICAL INSTRUCTION BOOKS FOR THE AUTOIST



## AUTOMOBILE DRIVING SELF-TAUGHT

By Thomas H. Russell, M.E.

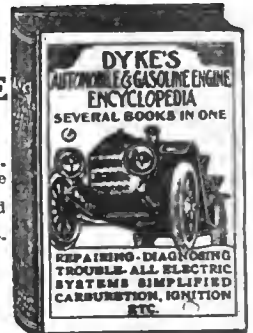
An exhaustive treatise on the Management, Care and Operation of Motor Cars. Pocket size, 230 pages, liberally illustrated, handsomely bound in black seal flexible leather, round corners, red edges.

Price, Flexible Leather, \$1.50  
Cloth Binding, \$1.00

## DYKE'S AUTOMOBILE and GASOLINE ENGINE ENCYCLOPEDIA

A teacher, guide and reference on everything pertaining to motoring—simple as the A-B-C's. It's worth ten times its cost, if only placed on the shelf and used as a reference. 1750 Illustrations. 696 Pages. 49 Instructions.

Price, \$3.00. (Add 25c. to prepay?)



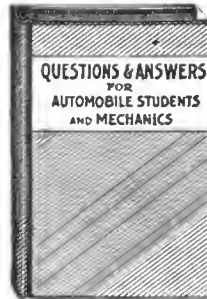
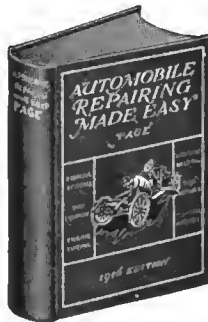
## AUTOMOBILE REPAIRING MADE EASY

By Victor W. Page, M.E.

1000 Specially made Engravings on 300 Plates. 1056 Pages (5 1/4 x 8). 10 Folding Plates.

Price, \$3.00 Net.

A Comprehensive, Practical Exposition of Every Phase of Modern Automobile Repairing Practice.



## QUESTIONS and ANSWERS

For Automobile Students and Mechanics

By Thomas H. Russell, A.M., M.E. A book of 600 Questions and Answers, adapted for teaching School, the Machine Shop or before the Board of Examining Engineers. This is the largest, the latest and most authentic book of its kind upon the market. Prepared especially for Home Study. 150 pages. Bound in Cloth. Stiff Covers. In fact, it is a regular text-book.

Price, Cloth, \$1.00; Leather, \$1.50

## AUTOMOBILE MOTORS AND MECHANISM

By Thomas H. Russell, M.E., LL.B. Pocket size, 265 pages. Blue, flexible leather, round corners, red edges, fully illustrated.

### CONTENTS

The Internal Combustion Engine—A Typical Modern Motor—Governors and Governors—Transmission Mechanism—The Clutch—Gear or Gearlug—Differential or Balance Gear—Shafts and their Functions—Lubrication and Lubricators—Pumps and their Purposes—Motor Misfiring, Causes and Remedies—Noises in the Motor, Causes and Remedies—Motor Overheating, Causes and Remedies—Electric Motors—Steam Cars.

Price, Flexible Leather, \$1.50  
Cloth Binding, \$1.00



## THE MODEL T FORD CAR

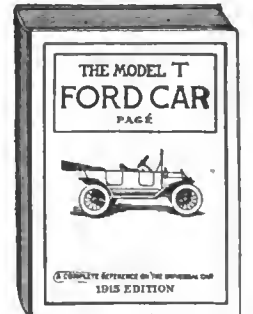
Its Construction, Operation and Repair

By Victor W. Page.

300 (5 x 7) pages. Over 100 specially made engravings and two large folding plates.

Price, \$1.00

This book is written for FORD DRIVERS and OWNERS. By a recognized automobile engineering authority and an expert on the FORD, who has driven and repaired Ford Cars for a number of years. He writes for the average man in a practical way from actual knowledge. All parts of the Ford Model T Car are described. ALL REPAIR PROCESSES ILLUSTRATED AND FULLY EXPLAINED.

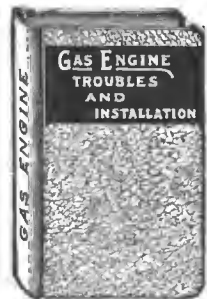
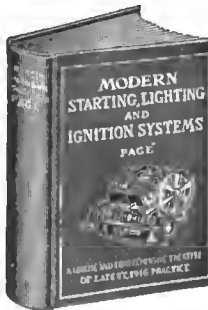


## MODERN STARTING, LIGHTING AND IGNITION SYSTEMS

By Victor W. Page, M.E.

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Silk Cloth, Gold Stamping, \$1.00  
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Book Dept., THE CLASS JOURNAL CO., 241 W. 39th St., N. Y. C.



*Franklin Hardware Co. Inc.*  
16 Franklin Street,  
New York August 24th. 1916.

General Asbestos & Rubber Co.,  
50 Dorset St.,  
N. Y. City.

Dear Sirs:

Replying to your letter of August 7th, with reference to GARGO Brake Band Lining, kindly be advised that we have had no real trouble or complaints from our customers. We have put this up against some of the best known makes of lining, and by actual tests some of our customers is superior to anything they had ever used. In fact we have not had any trouble what-so-ever calling GARGO Brake Band Lining, against any other brand.

Very truly yours,  
FRANKLIN HARDWARE CO.

HUGHSON & MERTON, INC.  
REPRESENTATIVES OF EASTERN MANUFACTURERS

Portland, Ore.,  
July 24th, 1916

General Asbestos & Rubber Co.,  
Charleston, S. C.

Dear Sirs:

Replying to yours of the 14th would say that in the last two and a half years, during which time we have acted as your Pacific Coast Distributors, we have had very satisfactory business on your line.

Particularly where we have done started a customer on GARGO to use stored stock and it has been almost impossible for anyone to switch him away. We have rarely had trouble with your Brake Lining and think there is absolutely none superior.

Wishing you continued success, we remain  
Yours truly,  
HUGHSON & MERTON, INC.  
PER [Signature]  
NORTHWEST CORNER

**FERRIS-DUNLAP AUTO SUPPLY CO.**  
DALLAS, TEXAS, JULY 14th, 1916.

General Asbestos & Rubber Co.,  
Charleston, S. C.

Dear Sirs:

As a sign to advise you that some of our customers have not only made some tests several other makes have tested GARGO lining with some customers placing their orders for GARGO, which again proves the merits of your lining.

We have used your lining for about three years, and will say that we are satisfied and pleased with it. We are sorry that we have not had the chance to test it, but we have with GARGO Brake Lining, which is our reason for writing to you.

Yours truly,  
FERRIS DUNLAP  
[Signature]

More than 150 Jobbers carry GARGO Brake Lining in stock. Ask yours to supply you.

# SATISFACTION—

From Portland to Portland—from Dallas to Duluth—hundreds of jobbers, dealers and motor car owners have paid voluntary tribute to the quality built into GARGO Brake Lining. Even these few letters shown here testify to the satisfaction of every GARGO user more clearly than anything we could say.



Your success can only be built on the basis of satisfied customers. Every time you use GARGO for a renewal job you not only make a substantial profit but make a strong bid for all the future business from your customer. Ask your jobber to tell you about the complete line-up of selling helps furnished free to GARGO dealers or write us direct.

**GENERAL ASBESTOS & RUBBER COMPANY**  
Main Offices and Factories CHARLESTON, S. C.

BRANCHES: 58 Warren St., New York      311 Water St., Pittsburgh, Pa.  
530 Golden Gate Ave., San Francisco, Cal.  
106 West Lake Street, Chicago



**Southern Auto Supply Company**  
DISTRIBUTORS AUTO SUPPLIES AND SPECIALTIES

CHATTANOOGA, TENNESSEE  
August 4th, 1916--

General Asbestos Rubber Co.,  
Charleston, S. C.

Dear Sirs:

We have been using Gargo Braking for some time and are pleased to state that we have received some very satisfactory reports from our many satisfied customers.

A braking that will hold in this mountain country is certainly a good braking.

We frankly say that Gargo will hold on the mountain roads longer than any other we have ever used.

Yours very truly,  
SOUTHERN AUTO  
[Signature]  
SAC'Y

**SPEARS & RIDDLE CO.**  
MILL, NIXE AND FACTORY  
SUPPLIES  
WHEELING, W. VA.

General Asbestos & Rubber Co.,  
Charleston, S. C.  
8/12/16.

Dear Sirs:

We have your letter of the 29. We are certainly pleased to hear that you are starting an advertising campaign on Gargo. We haven't the least doubt this will be of great assistance to all your dealers.

You know we have been handling Gargo Lining and sell it for about 2 years and in that time we do not recall that we have ever had a complaint or ever had a flat or it returned.

Gargo is one of the things that we have implicit faith in. We always feel when selling a man Gargo that he will be a satisfied customer and that he will get repeat orders. We also know that he is getting full value for his money.

We hope by the aid of your advertising campaign to very materially increase our sale of Gargo Lining.

Yours truly,  
SPEARS & RIDDLE CO.

**HUGHSON & MERTON, INC.**  
REPRESENTATIVES OF EASTERN MANUFACTURERS

SEATTLE, WASHINGTON,  
JULY 24 - 1916.

General Asbestos & Rubber Co.,  
Charleston, S. C.

Dear Sirs:

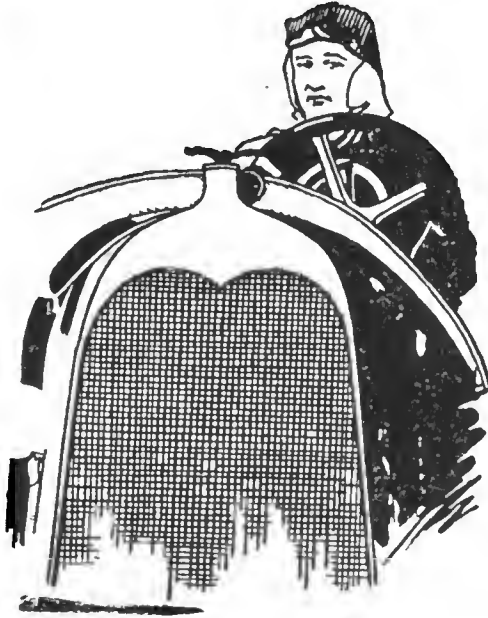
Replying to your communication of July 19th with reference to GARGO Brake Lining.

As a sign to advise you that since January first we have sold about 60,000 ft. of the Ford size of same and the same has given entire satisfaction. This is evidence of our line which also have given perfect satisfaction.

Yours very truly,  
HUGHSON & MERTON, INC.  
[Signature]



# VICTORIES =



Nothing demonstrates the position of FEDDERS Radiators in the American automobile game more clearly than the results of the races. Taking the racing results since mid-summer, we want to call your attention to the performance of cars equipped with



Here is a résumé of the Fedders' racing record for 1916.

Thirteen "firsts" out of twenty-seven officially sanctioned events. Forty-two "places" finished—and no Fedders-Equipt car was delayed at any time or forced to withdraw on account of cooling trouble.

## 1916 FEDDERS VICTORIES

<b>CONEY ISLAND CUP RACE, 20 MILES, NEW YORK, MAY 13.</b>		
Car and Driver		Finish
Maxwell—Rickenbacher	.....	4
Maxwell—Henderson	.....	5
<b>METROPOLITAN TROPHY RACE, 150 MILES, NEW YORK, MAY 13</b>		
Maxwell—Rickenbacher	.....	1
<b>INDIANAPOLIS INTERNATIONAL SWEEPSTAKES, 300 MILES, MAY 30</b>		
Maxwell—Henderson	.....	6
Premier—Wilcox	.....	7
<b>DES MOINES 150-MILE RACE, JUNE 24</b>		
Maxwell—Henderson	.....	2
Maxwell—Rickenbacher	.....	3
Stutz—Cooper	.....	5
<b>SIOUX CITY 10-MILE RACE, JULY 8</b>		
Premier—Wilcox	.....	4
<b>SIOUX CITY 20-MILE RACE, JULY 8</b>		
Premier—Wilcox	.....	1
<b>SIOUX CITY 50-MILE RACE, JULY 8</b>		
Premier—Wilcox	.....	1
<b>OMAHA 50-MILE RACE, JULY 15</b>		
Maxwell—Rickenbacher	.....	2
Maxwell—Henderson	.....	3

<b>OMAHA 150-MILE RACE, JULY 15</b>	
Maxwell—Henderson	..... 4
<b>TACOMA MONTAMARATHON, 300 MILES, AUG. 5.</b>	
Maxwell—Rickenbacher	..... 1
Maxwell—Henderson	..... 5
<b>CINCINNATI DERBY, 300 MILES, SEPT. 4.</b>	
Peugeot—Altken	..... 1
<b>INDIANAPOLIS 20-MILE RACE, SEPT. 9</b>	
Peugeot—Altken	..... 1
Premier—Wilcox	..... 2
<b>INDIANAPOLIS 50-MILE RACE, SEPT. 9</b>	
Peugeot—Altken	..... 1
Premier—Lewis	..... 5
<b>INDIANAPOLIS 100-MILE RACE, SEPT. 9</b>	
Peugeot—Altken	..... 1
Premier—Lewis	..... 5
Maxwell—Henderson	..... 7
<b>ASTOR CUP RACE, 250 MILES, NEW YORK, SEPT. 30</b>	
Peugeot—Altken	..... 1
Maxwell—Rickenbacher	..... 2

<b>GRAND AMERICAN, 250 MILES, CHICAGO, OCT. 14</b>	
Peugeot—Resta	..... 1
Peugeot—Altken	..... 2
Maxwell—Rickenbacher	..... 3
Premier—Lewis	..... 4
Maxwell—Henderson	..... 5
Premier—Galvin	..... 6
<b>HARKNESS TROPHY RACE, 100 MILES, NEW YORK</b>	
Peugeot—Altken	..... 1
Premier—Galvin	..... 2
Peugeot—Wilcox	..... 3
Maxwell—Henderson	..... 4
<b>VANDERBILT CUP RACE, 294 MILES, SANTA MONICA, CAL., NOV. 16</b>	
Peugeot—Resta	..... 1
Stutz—Cooper	..... 2
<b>GRAND PRIZE RACE, 403 MILES, SANTA MONICA, CAL., NOV. 18</b>	
Peugeot—Altken—Wilcox	..... 1
Stutz—Cooper	..... 2
<b>ASCOT DERBY, 150 MILES, LOS ANGELES, CAL., NOV. 30</b>	
Stutz—Cooper	..... 2
<b>UNIVERSAL TROPHY RACE, 112 MILES, UNIONTOWN, PA.</b>	
Premier—Lewis	..... 2

This showing proves that the FEDDERS is still in its place as the foremost American Radiator

# FEDDERS MANUFACTURING CO., INC.

BUFFALO, N. Y.



## Prodium Makes Tires Better, Sales Bigger

**P**RŌDIUM is to tires as vanadium to steel. The Prodium Process, exclusive with Republic, is the toughest compound known to tire-making.

Its discovery, a year and a half ago, has increased the wear and lengthened the life of Republic tires.

## REPUBLIC PRŌDIUM PROCESS TIRES

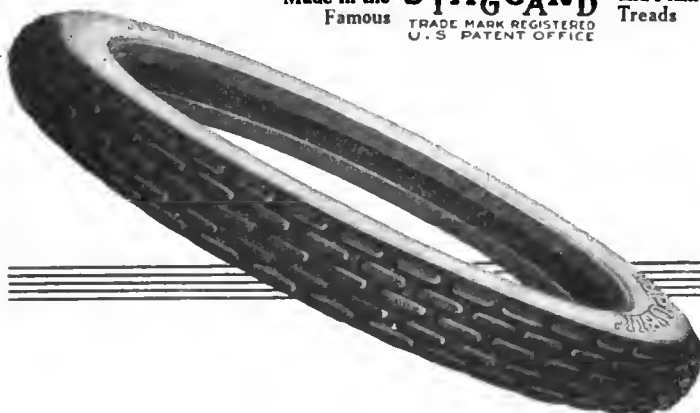
Republic quality has not only been bettered; the economic process and greater volume have reduced the price, so that now they cost practically the same as other tires.

The growing demand, bigger value and better price make Republic dealership doubly profitable.

*Republic Black-Line Red Inner Tubes give complete satisfaction.*

**The Republic Rubber Company**  
Youngstown, Ohio

Made in the **STAGGARD** and Plain  
Famous TRADE MARK REGISTERED  
U. S. PATENT OFFICE Treads



**"I Consider It Quite a Necessity"—This Is The Opinion of One User of The**



## Warning Signal

*New York, Jan. 10, 1917.*

*"Regarding the Nafra Warning Signal, would say, that the one on my car has worked perfectly up to the present time, and I consider it quite a necessity, as there are frequent times when the driver is unable to get his hands out on account of the curtains. I would advocate it for any man who runs a car.*

*"As I have said before, it has worked perfectly, and I feel a safety in riding in having it attached to my car."*

*Yours very truly,*

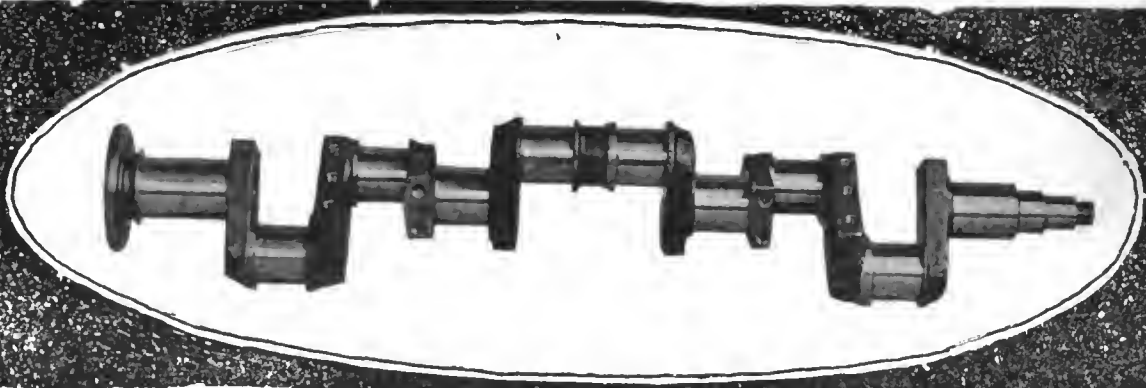
*(Name on request.)*

The Nafra gives you collision insurance at a price that is negligible. It signals unfailingly, every time your brake is applied—it is "forget-proof." The waving red Nafra disk by day, or the waving red Nafra light by night, gives a warning to the car behind that cannot be overlooked. Put a Nafra on your car, and be safe.

Dealers:—Every Nafra you sell sells another. Be ready. Get the prices and discounts now.

**The Nafra Company, Inc.**

120 Broadway, New York



## MOLTRUP'S MACHINED CRANKSHAFTS

### • Quality Production Assured •

WE FINISH CRANKSHAFT FORGINGS for practically all sizes of motors.

OUR NEW FIREPROOF PLANT is equipped with the most up-to-date crankshaft machining devices in the country.

OUR LATHES AND GRINDERS ARE ALL new, insuring the most accurate work so far as alignment and balance is concerned.

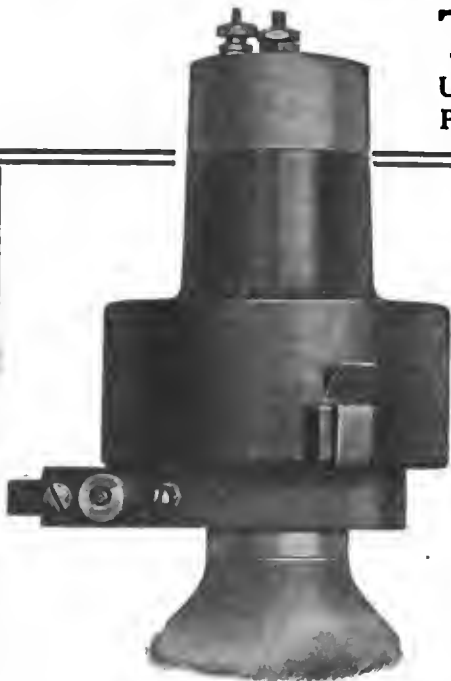
TWENTY YEARS' EXPERIENCE HAS made us experts in this line and our work is of the highest quality possible to obtain.

Note:—Our capacity has been increased and we are now planning our 1917 production. May we submit an estimate on your work?

**MOLTRUP STEEL PRODUCTS CO., Beaver Falls, Pennsylvania**

## The PITTSFIELD DISTRIBUTOR

Uses Current Only When Necessary To Produce Spark—Make and Break Positively Mechanical Operations—No Springs, Trips, or Hammers.



THE KEYNOTE OF THE PITTSFIELD BATTERY IGNITION SYSTEM is in the breaker mechanism of the Distributor.

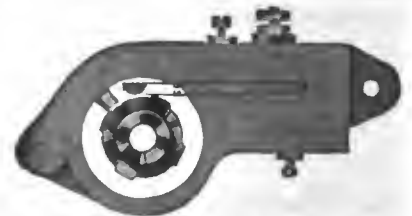
As your braking cam revolves it first forces the platinum points together (as illustrated); then, in the same cycle, it forces them apart. You will note that this action is entirely independent of springs, being positively and completely effected by the cams.

The contact is firm and certain, but of such short duration that current consumption is exceedingly small, although ample to produce hot sparks at speeds greatly in excess of the highest engine demand.

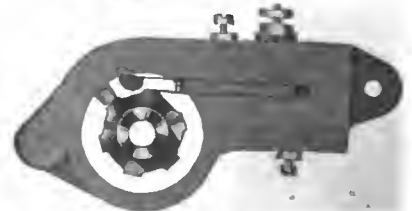
Lags—both electrical and mechanical—are practically eliminated, and the synchronization of timing is practically perfect.

The whole outfit is compact, and made into a single unit, including the coil. The only external wire (except spark plug leads) is the lead to the battery.

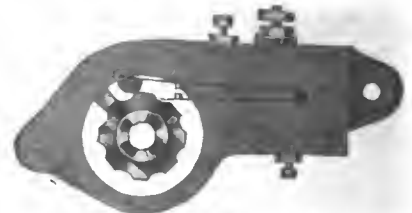
**PITTSFIELD SPARK COIL CO.**  
PITTSFIELD MASS.



4-cylinder model, showing lower point being lifted into contact.

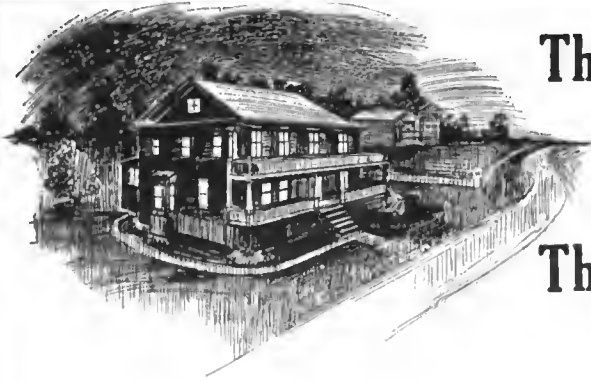


6-cylinder model, showing points in contact.



8-cylinder model, showing upper point lifted out of contact.

Please mention The Automobile when writing to Advertisers



# The General Gas-Electric Company

OF HANOVER, PA.

Announces to the Trade

## The GENCO-LIGHT Power Plant

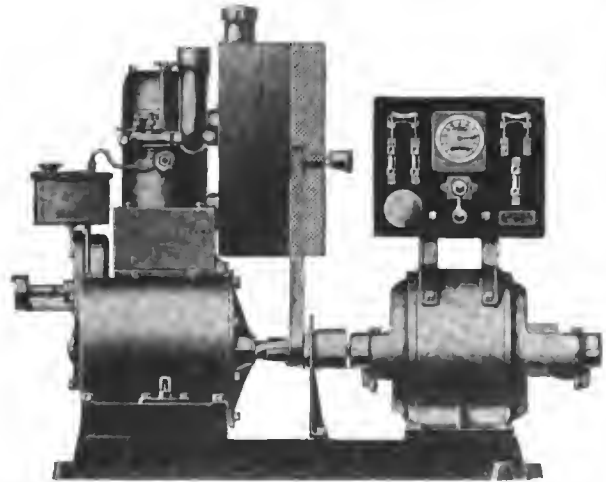
and is in a position now to appoint dealers.

The GENCO-LIGHT Plant produces electricity at four cents a kilowatt-hour, it is the Ideal Farm Lighting Plant, besides it can operate as a self-starting 2 H.P. gasoline or kerosene engine.

Our product is of very high grade. Our dealer's proposition is very attractive. The opportunity of representing a money-maker is yours now. Write for dealer's proposition. Our selling season is all year round.

**GENERAL GAS-ELECTRIC COMPANY**

HANOVER, PA., U. S. A.



The above cut shows a GENCO-LIGHT Power Plant

# This Is the Plug



These Are  
the Manufacturers Who  
Equip With

# AC

*The Standard Spark Plug of America*

Accept No Plug Unless AC  
is Burnt Into the Porcelain

Sold  
Everywhere

Cadillac  
Pierce-Arrow  
Packard  
Marmon  
Hudson  
Chalmers  
Hupmobile  
Chandler  
Haynes  
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Dort  
Cole  
Reo  
Paige  
Peerless  
Pilot  
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Bulck  
Oakland  
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Moreland  
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Chase Truck  
Willcox Truck  
Sterling Truck  
Republic Truck  
Diamond T  
Truck  
United Trucks

No Greater Recommendation  
Can Be Given a Spark Plug

Champion Ignition Co.

Flint, Mich.

Have You  
This Plug  
On Your Car?

# DYKE'S HOME STUDY COURSE OF \$15.95 AUTOMOBILE ENGINEERING

Prepaid  
For Your Boy, Yourself, Your Chauffeur

Consists of

Fifty simplified instructions with 1750 illustrations treating every detail of the automobile from the principle and construction to valve timing, etc., with examination questions which bring out just those points you want to know and ought to know—points you would never gain by reading a book.

- 1—Working model of single cylinder "T" head engine.
- 1—Working model of magneto.
- 1—Working model of carburetor.
- 1—Working model of clutch and gear box.
- 1—Working model of differential.
- 1—Working model of 4-cylinder "L" head engine.
- 1—Working model of 6-cylinder "L" head engine.
- 1—Progressive chart manikin.

All packed in a neat box with full instructions.

**THE EXAMINATIONS:** Don't lose sight of the fact that the examinations are the chief feature of this course. A person will learn a great deal more by answering the examination questions than he would by merely reading a book—because he must look up the answers to the questions before writing them down, and when he writes the answers down he memorizes, and step by step he advances in a progressive manner.

## DYKE'S AUTOMOBILE \$12.95 INSTRUCTOR

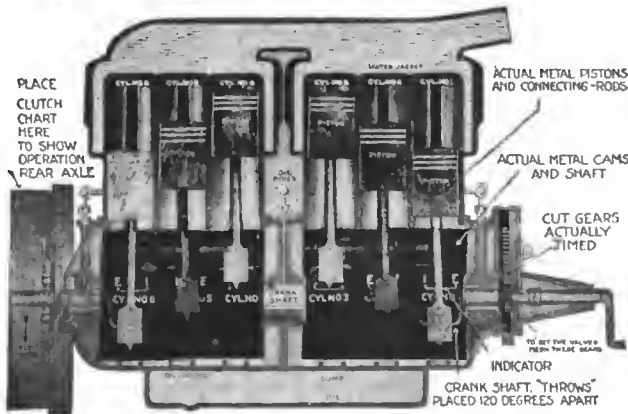
Consists of all the above but without examinations and instead of course being divided into four books, it is bound into one book; the Auto Encyclopedia.

### What Noted Motor Authorities Say

Lord Montagu of Beaulieu, member of the House of Lords and founder of the great Brooklands automobile tracks near London, writes: "I have read your Auto Instructor and consider it to be of great value." Elwood Haynes: "I regard this as just the kind of instructor needed, in order to show not only the mechanism, but to show it in actual operation." Chas. Duryea: "I did not think it possible to get so much real information into such an instruction and yet keep it so concise and simple." Barney Oldfield: "If a person can't learn from this he can't learn at all." Elbert Hubbard (deceased), said: "Your proposition seems to me the most reasonable and direct method of teaching a beginner."

Mr. Dyke has been identified as a pioneer inventor, supplyman, etc., with the auto industry since its beginning. He originated the first auto supply company and manufactured and marketed the first float type carburetor and published the first practical automobile book in America.

**THE DYKE METHOD OF INSTRUCTING BY MAIL** is a new idea. A new invention. Working models are used on which you can see the parts in actual operation.



This is the crank shaft and piston side of the 6-cylinder engine model. This model and 6 others included with course. Price of 6-cyl. engine model alone, \$3.35 prepaid. (Models work by hand.)

Write now for descriptive matter or order a set today. The supply of models is limited. (Imported from London.)

Note—if you don't care to invest \$15.95, send for a copy of Dyke's Automobile Encyclopedia—5th edition, price \$3.30 prepaid, or the 4-cylinder engine model \$2.50. The 6-cylinder GN model is \$3.50 if purchased separately.

The Remy Electric Co., the big company who make electric systems for some of the leading auto manufacturers, say: "After inspecting your fifth edition we have found it to contain more valuable information covering all of the equipments as applied to automobiles than any book that we have investigated on this subject."

Address A. L. DYKE, Publisher and Importer  
Box 24, Roe Building, St. Louis, Mo.

# MOTOR WORLD

DEALERS, JOBBERS AND GARAGEMEN

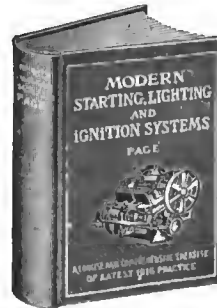
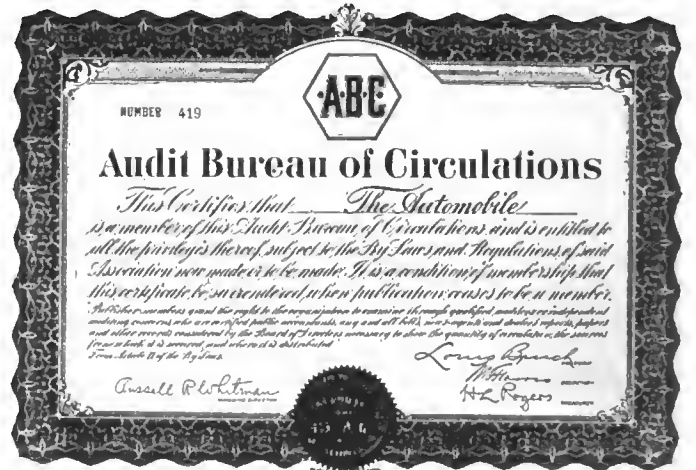
More than a "trade paper"—an institution of service for the merchandise and maintenance departments of the car and accessory industry. Builds sales—improves service—increases profits.

Published weekly, \$2.00 per year—Canada and foreign \$4.00. Subscriptions solicited only from men in the trade. Send subscriptions to

## MOTOR WORLD

239 West 39th Street

New York City



## Modern Starting, Lighting and Ignition Systems

By VICTOR W. PAGE, M. E.

Member Society of Automobile Engineers  
Author of "The Modern Gasoline Automobile," Etc.

250 Specially Made Engravings

Nearly 400 (5 1/2 x 8) Pages. Folding Plates

PRICE \$1.50

### A Self-Educator on Electrical Systems

THIS practical volume has been written with special reference to the requirements of the non-technical reader desiring easily understood explanatory matter relating to all types of automobile ignition, starting and lighting systems. It can be understood by any one, even without electrical knowledge because elementary electrical principles are considered before any attempt is made to discuss features of the various systems. These basic principles are clearly stated and illustrated with simple diagrams. ALL THE LEADING SYSTEMS OF STARTING, LIGHTING AND IGNITION HAVE BEEN DESCRIBED AND ILLUSTRATED WITH THE CO-OPERATION OF THE EXPERTS EMPLOYED BY THE MANUFACTURERS. WIRING DIAGRAMS ARE SHOWN IN BOTH TECHNICAL AND NON-TECHNICAL FORMS. ALL SYMBOLS ARE FULLY EXPLAINED. This is a book of REAL MERIT.

A COMPREHENSIVE REVIEW OF MODERN STARTING AND IGNITION SYSTEM PRACTICE INCLUDES A COMPLETE EXPOSITION OF STORAGE BATTERY CONSTRUCTION, CARE AND REPAIR. Explains all types of starting motors—Generators—Magnets and all ignition or lighting system units.—Considers the systems of cars already in use as well as those that are to come in 1916.—A book every one needs.

Nothing has been omitted, no details have been slighted. A book you cannot afford to be without.

Book Department

THE CLASS JOURNAL CO., 239 West 39th Street, New York City

# PARK INTEGRALLY COUNTER BALANCED

Patent Applied for

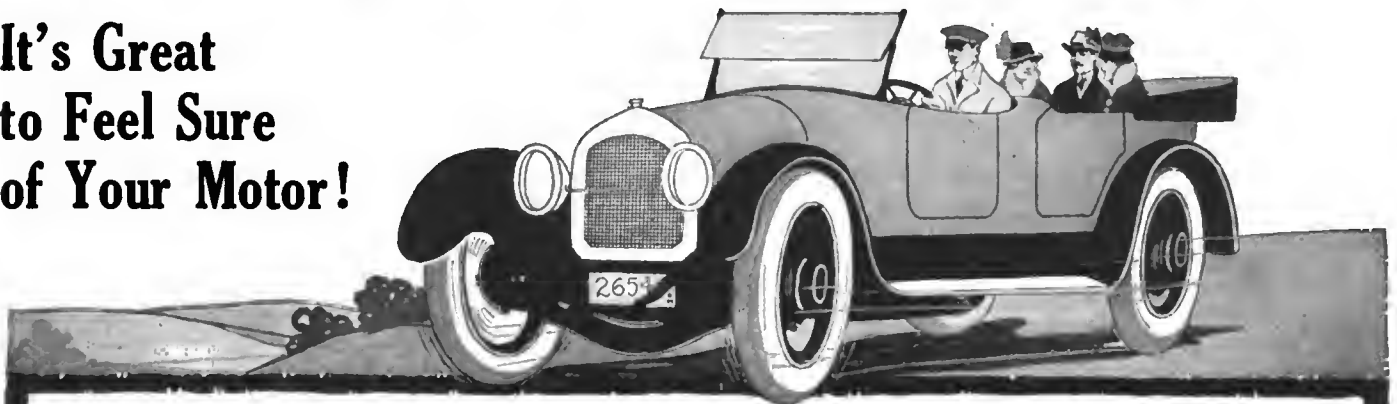


Quick Get-a-way  
Higher R. P. M.  
Reduced vibration  
Smoother running motor  
Eliminated bearing troubles

*We have shipped 35,623 Counterbalanced  
Crankshafts to February 20, 1917*

**The Park Drop Forge Co.**  
Cleveland

It's Great  
to Feel Sure  
of Your Motor!



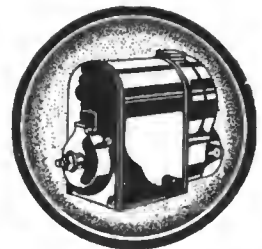
When you KNOW every explosion will give you ALL its power—that's when motoring is solid satisfaction. The

# EISEMANN

MAGNETO

makes complete combustion certain. It drives its intense, penetrating spark through the densest compression. Mixture rich or lean, motor racing or barely turning over, you'll be sure of full power if your car is Eisemann equipped!

**THE EISEMANN MAGNETO COMPANY**  
Sales and General Offices, 32-33d St., Brooklyn, N. Y.  
Detroit, Mich., 802 Woodward Ave.



Please mention The Automobile when writing to Advertisers



## The Original Double Arm Shock Absorber

It is of the utmost importance that you remember—when thinking of the W & C Shock Absorber—that it is the original Double Arm Shock Absorber for Ford Cars.

The extra strength and life, the higher efficiency of the Double Arm Principle are enjoyed by no other shock absorber for Ford Cars.

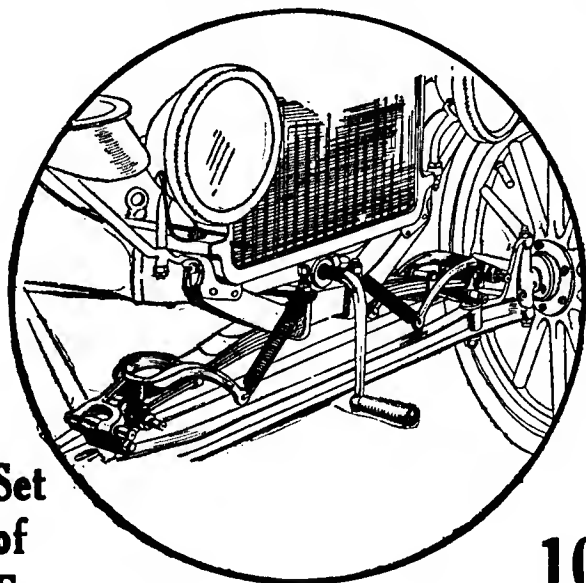
# W & C

## Shock Absorbers for Ford Cars

—are constructed on the famous cantilever principle. They are the final and conclusive proof that in the original double arm shock absorber, realization will always exceed anticipation.

*Try it yourself—and see*

**PHILIP H. WEBBER AND COMPANY**  
HOOPESTON, ILLINOIS



Set  
of  
Four

10



## THE MORE A MAN KNOWS

about motors the higher is his opinion of the Wisconsin. In design, in materials, in workmanship, Wisconsin Consistent Motors are unexcelled. Our attention is fixed on keeping the quality up, not on speeding production up. Write for specifications of motors for pleasure cars, trucks or tractors.

**WISCONSIN MOTOR MFG. CO.**

Sta. A, Dept. 310 MILWAUKEE, WIS.

New York Branch: 50 Church St.

T. M. Fenner, Factory Representative

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## QUALITY RADIATORS

FOR  
PLEASURE CAR  
AND  
HEAVY DUTY SERVICE

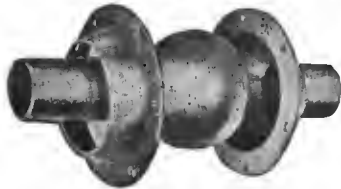
**G & O MFG. CO.**

NEW HAVEN

CONN.

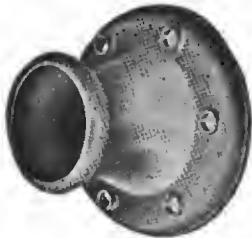
# BOSSERT

In the most perfect plant that brains, money and experience could devise, we have the men and equipment to produce pressed steel parts in any quantity on comparatively short notice. We make more than 200 pressed steel parts and you can make your vehicles lighter and at lower cost, without sacrificing strength if you use *pressed steel* spring hangers, running boards, brake drums, etc., instead of malleable iron, steel castings and drop forgings.



## "THE BOSSERT WAY"

stands for the prompt delivery of your order filled in accordance with every item of the specifications.



**The Bossert Co.**  
UTICA  
N. Y.

## Ever notice the difference

in the engine speed by varying the spark lever?

Most magnetos give their best spark in the advance and are consequently weak when retarded while throttling.

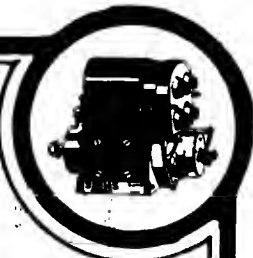
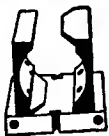
The patented pole shoes used in

# HIGH TENSION SIMMS MAGNETOS

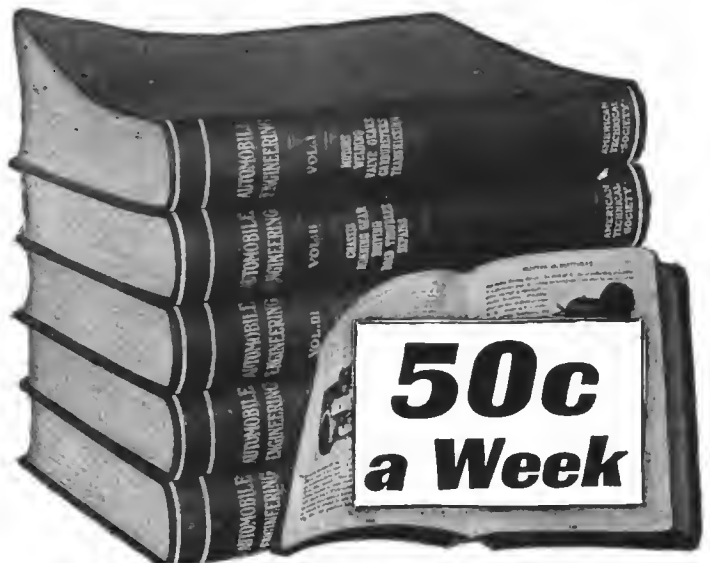
account for their ability to generate the most intense spark at low speeds in the retard and in the advance at high. One reason for their flexibility and surplus power producing spark.

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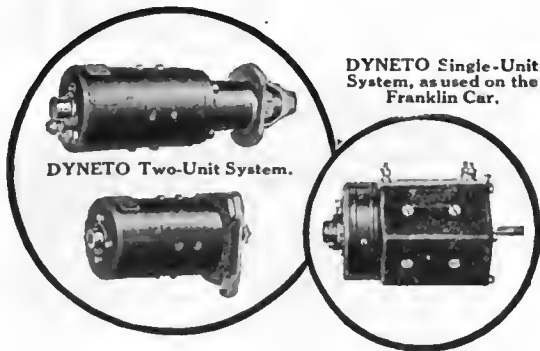
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DYNETO Single-Unit System, as used on the Franklin Car.

DYNETO Two-Unit System.

## Compare DYNETO Unsparingly!

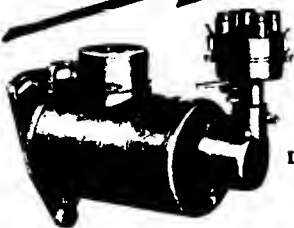
TAKE down the whole system. Examine its vitals. Compare them, part for part, with those of any or every other system in all Motordom. Match Dyneto's clean, smooth, steel-stamped shell against the crude castings of other systems.

Compare Dyneto's heat-treated, nickel-steel, accurately ground armature shaft. Examine the commutator—its body of hard-copper bars and perfect mica insulation. Note Dyneto's pole-pieces of cold-drawn steel.

Realize that all parts are strictly interchangeable and held to very close limits. Spin the armature with your fingers and hold your ear close. Make any other comparison you can think of.

Then consider that the maximum output of the Dyneto generator is at a car-speed of 15 to 20 miles per hour, giving full efficiency at normal driving-speeds. Our Engineering Bureau is always at your service. Write us.

# Dyneto



Dyneto Instrument with Ignition Attachment

**STARTING-LIGHTING SYSTEMS**

Single- and Two-Unit

**DYNETO ELECTRIC CORPORATION**  
Syracuse, New York



## Written For You

Just write us today for Your Copy

**THE BOOKLET TELLS:**

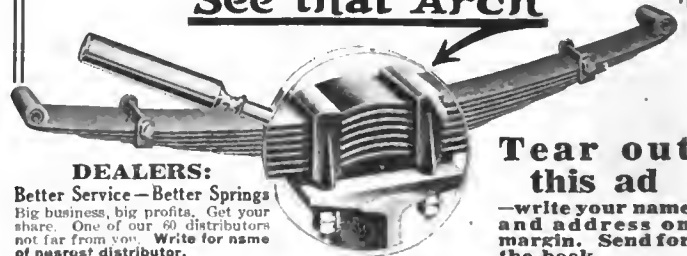
Why springs break—and why 75 out of every 100 break at the center—because of the weakening center nib or bolt.

How springs can be kept from breaking—and how Tuthill Titanics are used for more replacements than all other makes put together. They don't break! See that Arch! You get a guarantee forever against center breakage, and a guarantee against breakage at any other point for one year, in

## TUTHILL Lubricated TITANIC SPRINGS

TUTHILL SPRING CO., 760 Polk St., Chicago

See that Arch



**DEALERS:**

Better Service—Better Springs! Big business, big profits. Get your share. One of our 60 distributors not far from you. Write for name of nearest distributor.

**Tear out this ad**

—write your name and address on margin. Send for the book.



Use the facilities of this perfectly equipped plant for the production of small sheet metal stampings of any design, also

**BRASS CASTINGS**

In the Rough, Polished or Nickel Plate

Including Hub Caps, Radiator Filler Necks with Caps, Gasoline Tank Flanges with Caps, Gasoline Tank Flanges for Outlets, Hood Yokes, Ford Special Hub Caps and other parts made of Cast Brass.

**Our Well-Equipped Wood-Working Department**

is prepared for the prompt production of quantity orders of rough or highly finished wood-work assemblies of medium size for motor car construction, such parts as rest blocks for shipping, flooring boards, back spring boards, running boards, etc.

We work from Blue Prints and Specifications, but prefer, when possible, to also have samples for the purpose of securing positive accuracy in weight, measurements and design.

Write us at once for further information regarding the production of your requirements.

**The Pfau Mfg. Co.**



**Cincinnati Ohio**

230 Mentor St.



Front View

## Why Not Be Sure

that every part of the engine, chassis, or body of the car you make will **stay together** until taken apart?

Showing Spring Nut Lock applied loose on bolt before being set in place to hold until taken off.

# Spring Nut Locks

are the simplest, surest, safest device to positively lock any nut on any bolt. Resists all vibrations. Cannot harm threads. Easily applied. Released whenever desired.

### Cheapest and Best

**Manufacturers, Jobbers, Garage Men, Repair Men and all Dealers should write for prices on sizes now available. Orders filled in rotation. All sizes by January 1st.**



Rear View

Spring Nut Lock tightened against Nut. Prevents Nut being shaken off and follows Nut tightening against material.

**Spring Nut Lock Co.**  
648 Transportation Building  
Chicago



## 9 OUT OF 10


Want the



### POWER TIRE PUMP

Order From Your Jobber.  
Or Write Us.

**BAY STATE PUMP COMPANY**  
100 Purchase Street  
Boston, Mass.



# Coated Textiles

of


# Highest Quality

We manufacture artificial leather, or leather cloth, for upholstering and trimming automobiles.

Our product is used extensively by the largest manufacturers.

Our plant is modern in every respect and enables us to manufacture a uniformly high-grade product.

We make special goods for special purposes, and



will solve your upholstery problems.

We invite inquiries.

## The Cotex Company

**NEWARK**

## NEW JERSEY

# Firestone Truck Tires

For every road, load and condition of service. Most Miles per Dollar.  
Write for catalog.

**FIRESTONE TIRE AND RUBBER COMPANY**  
Akron, Ohio  
Branches and Dealers Everywhere

## DETROITER SIX-45

The Six of Advanced Construction

UNIQUE VALUE **\$1250** RAPID SELLER

Detroit Motor Car Co., Detroit, Mich.



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INTERNAL GEAR DRIVE AXLE

92% Efficient at all speeds regardless of load and road conditions

## MOTOR AGE

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PUBLISHED WEEKLY AT CHICAGO  
Yearly Subscription Price—52 issues—\$3.00

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If you are interested in new car and accessory descriptions, racing reports, touring data, and questions and answers that appeal to the motorist, subscribe to:

**MOTOR AGE**  
MALLERS BUILDING CHICAGO, ILLINOIS

Passenger and Commercial Car Motors

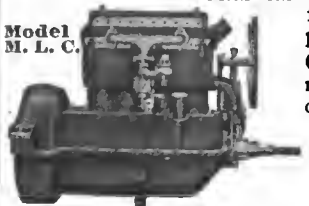
## Beaver Motors Fit Every Demand

There are BEAVER Motors in a variety of sizes, suitable for all pleasure car and commercial car requirements. Meet all demands for power, economy and dependability.

Over-head valves. 20% to 25% more power than other motors of same bore and stroke.

Write today for BEAVER specifications before deciding on the motor to use.

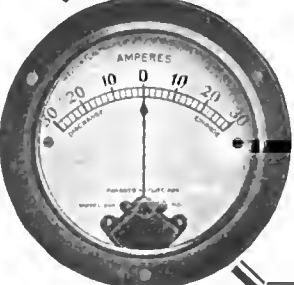
**BEAVER MFG. CO.**  
1st & Oklahoma Ave., Milwaukee, Wis.



Model M. L. C.  
4-Cylinder—4-Cycle

## If Your Lights Should Fail!

Think what it might mean on a black night, with a bad road! Don't risk it. Put a



## Weston

MODEL 354 AMMETER

On Your Dashboard or Cowl


It is a reliable means of determining the proper rate of charge or discharge of your battery for various speeds. It enables you to determine that the generator is working and that the storage battery is receiving its proper charge. Write us.

Weston Electrical Instrument Co.  
8 Weston Ave., Newark, N. J.  
23 Branch Offices in the Larger Cities

## National Speedway Tires

For quality, stamina, strength and general dependability, just test a NATIONAL "Speedway" against the tires you are now using.

National Rubber Co., Pottstown, Pa.



## POVASCO PRODUCTS

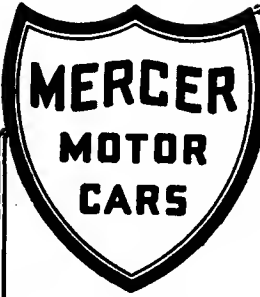
Indestructibility, Beauty, Tilting and Hand Warming are the Povasco features that place it beyond any other Steering Wheel. Our proposition on wheels and radiator caps is interesting to distributors and manufacturers

**POUVAILSMITH CORPORATION**  
Poughkeepsie, New York



Plain Povasco Tilting & Warm Hands Radiator Caps

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**22-73 SERIES**  
 They follow closely the lines of the preceding series, and the only changes are in the nature of refinements.

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- 22-73 Sporting
- 22-73 Runabout
- 22-73 Raceabout
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 400 Whitehead Road      Trenton, N. J.

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 DUNKIRK, N. Y.

Body Builders for over 50 years

Demountable Tops for Franklin, Cadillac and Cole

Write or wire for details.      Quick delivery



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 a Model T or TK


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will start any automobile or truck motor—on first lift of crank. Operates on inductor principle. Operates any number of cylinders up to 12. Write for catalog and full information.

Oil, dirt and oil-proof construction. Operates any number of cylinders up to 12. Write for catalog and full information.

Remember a K-W Magneto Fires Any Kind of Fuel

**THE K-W IGNITION CO.**  
 2833 Chester Ave.      CLEVELAND, OHIO, U.S.A.

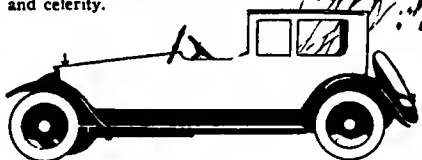


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**WHAT IS YOUR UNDERSTANDING OF FLEXIBILITY?**

Flexibility means (according to the advertisements) the ability of a car to slip from low speed into high, or from high into low, with extreme smoothness and celerity.

Flexibility—approached in other cars—is actually attained in the Owen-Magnetic.



**BAKER R & L COMPANY**  
 Cleveland, Ohio  
 Manufacturers of OWEN MAGNETIC MOTOR CARS

Salesrooms—      New York      Boston      Philadelphia      Chicago



**INDIANA TIRES**

Inner Tubes, Inner Liners, Outer Boots, Inner Sleeves, Blowout Patches, Cementless Patches, Cement Patches, Red Rubber Tubing

INDIANA RUBBER AND INSULATED WIRE CO.  
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**NEW PROCESS**  
 ACCURATELY CUT METAL GEARS and BAILEY non-skid non-stall differentials



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Under Nearly Every Hood

**ECLIPSE-BENDIX DRIVE**

Transmits Starting Power on 125 Makes of Automobiles

**ECLIPSE MACHINE CO.**  
 ELMIRA, N. Y.

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 NITROJECTOR NO 100  
 THE 100% PERFECT SPOTLIGHT



**\$10**

Complies with all laws for no-glare devices. Other dependable Old Sol Spotlights are No. 70 — \$7.00, No. 77 — \$5.00. Ask for Old Sol for Safety

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**For Your Car**  
Atwater Kent Mfg. Works  
Philadelphia, U.S.A.



Used the World Over  
**SKF**  
Quality and Service

Our **UNIVERSAL** Quality  
is  
*Your Eventual Economy*

The  
**Hartford Automobile Parts Company**  
Hartford, Connecticut

Dependable Manufacturers      Universal Drivers



**E. & J. SPOTLIGHT**

Motorists insist on having the best spotlight manufactured. DEALER: Satisfy your customers by selling them the best and latest improved Spotlight manufactured. Complete in every respect. Ready to attach.

Edmunds & Jones Corporation  
Detroit, Michigan

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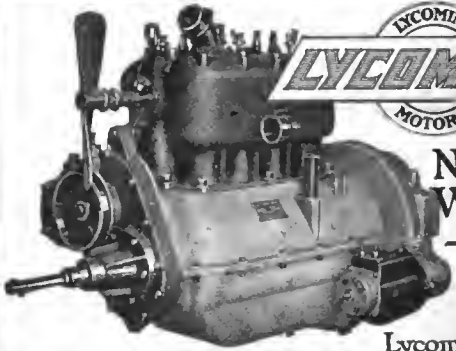
Model N....3½x5  
Model N....3½x5  
Model C....3½x5¼  
Model C....4¼x5¼  
Model E....4½x5½

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*"America's Standard Motor"*

**Continental Motors Corporation**  
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Motors

Nothing in the World like it  
- for Power -

Lycoming Foundry  
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CORCORAN - VICTOR CO.  
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AXLES WHEELS  
PROPELLERS

Salisbury Wheel  
& Axle Co. Inc.  
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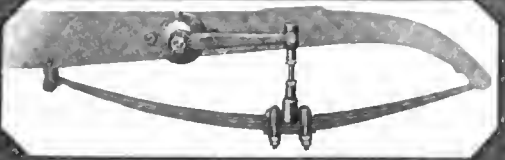
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(PRONOUNCED HOO-DIE)  
HYDRAULIC SUSPENSION

The only Hydraulic Shock Absorber. Only one adjustment. Only one moving part. Fits any car. No springs or frictional discs. Manufacturers tests invited.

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*"The leading engineers endorse it."*

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26 YEARS EXPERIENCE

### DYNAMO CONTROLLERS

FOR LIGHTING AND STARTING SYSTEMS

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MT. VERNON, N. Y., U. S. A.

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F A H R I G M E T A L



THE BEST BEARING METAL ON THE MARKET

Fabrig Metal is an exceptionally homogeneous tin base copper hardened alloy made by our special process from Stralts tin and ingot copper. We make every pound of Fabrig Metal ourselves and can guarantee its uniformity and quality. Ask Stutz, Simplex, Craze, Wisconsin, Kissell, Waukesha, Kelly-Springfield, Beaver, Curtiss and the man who makes finished bearings.

Fabrig Metal Company, 34 Commerce Street, New York

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## GREASE CUPS, OIL CUPS AND OIL HOLE COVERS

SPRING SHACKLE BOLTS

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METAL STAMPINGS

IN LARGE QUANTITIES



Plain Manufactured by Sectional  
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Western Office: 604 Ford Building, Detroit, Mich.



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RADIAL RETAINERS

COMPLETE THRUST BEARING

MADE IN AMERICA

Manufacturers of Star Radial Ball Retainers, Star Ball Thrust Retainers, Star Complete Ball Thrust Bearings

## THE FULTON TRUCK

Dealers—Write for territory still open

The first full 3000-pound capacity chassis ever offered at

**\$1090**

Fulton Motor Truck Co.  
Farmingdale, Long Island  
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"The Exceptional Motor"


combine battleship strength with aeroplane lightness. The design, the materials, the construction, all make for greater efficiency. Catalog L gives full details. Write for it.

WAUKESHA MOTOR CO.  
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Controlling the Perlman Demountable Rim Patents

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Years spent in its development. Write us asking its uses. Can be used to replace platinum.

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Patentees and Sole Manufacturers  
1984 East 66th Street Cleveland, Ohio

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## STARTING—LIGHTING—IGNITION

"Cincinnati" Batteries, owing to their special features of construction, have a higher starting ability than other batteries of the same dimensions. This is due to the single sealing arrangement which does away with the bulky sealing compound usually poured over the entire top of the battery. This space is used in "Cincinnati" Batteries for additional plate room, permitting the use of larger plates and thus securing a more powerful battery.

Write for catalog A, which gives full details of these batteries. We have an attractive proposition for live dealers.

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225 and 230 Stark Street CINCINNATI, OHIO

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THE greatest instrumentalists on the greatest instruments of music are reproduced at their artistic best on Columbia Double-Disc Records.

Whether it is a violin solo by Ysaye, Eddy Brown, or Kathleen Parlow, or a 'cello solo by Casals, the wizard of the 'cello, Columbia reproductions possess a matchless quality of beauty. Listen to the records by these artists today—to hear them is proof enough.

**Columbia Graphophone Co.**  
*Dealers Everywhere*

*Ysaye*



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for motors which lack power waste, gasoline and oil and carbonize quickly is to have

### BUTLER MFG. CO., INDIANAPOLIS, IND.

Established 1897



**Regrind the Cylinders and Fit Semi Cast Iron Pistons for all**

**Standard Cast Iron Pistons, Piston Pins**

Write for prices. We give nothing but high class workmanship and material.

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Motor Topping

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## Internal Gear Drive Axle

There are certain constructive features of internal gear drive construction with which you may not be acquainted.

Our booklet, "Twelve Talks to Engineers," may give you a new viewpoint. Write for it.

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# HOUK

QUICK-CHANGE WIRE WHEELS

HOUK MANUFACTURING COMPANY Buffalo N.Y.



# JUMBO SPARK PLUGS

are built to stay on the job under the hardest conditions. We show here our big leader

**JUMBO "MOLITE"**  
Price, \$1.25

Guaranteed for the Life of the Car. Other types for Fords and other cars, \$0.75 and \$1.00. Ask your dealer.

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You don't just expect good service from

# BRAENDER

TIRES & TUBES  
—you get it

Write for particulars about BRAENDER "Bull-Dog" Non-Skid—the Fastest, Safest, Smoothest Riding Tire Made.

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Branches:  
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BRAENDER "Bull-Dog" Non-Skid Trade Mark

## LASTS LONGER THAN GREASE

One filling of NON-FLUID OIL will last from 2 to 3 times as long as grease—and give better lubrication.




Is ALL pure lubricant; therefore lubricates to the last particle. Unlike grease it doesn't melt and waste away; it cannot harden and become useless. NON-FLUID OIL gives gears and bearings a longer lease of useful life.

Get K-00 Special grade for gears—K-000 for bearings.

Write for free samples and book "Lubrication of the Motor Car."

**NEW YORK & NEW JERSEY LUBRICANT CO.**  
165 Broadway, New York

# Stop!

and get a *First Aid*

# MARTINKIT

TRADE MARK

It costs only \$2.00 and offers protection for yourself, your children and friends against painful or dangerous results from skinned fingers, cuts, burns, lacerations, or even bad wounds.

Everything you need for first aid in emergency—packed in a small tin box.

**Martin Auto Accessories Corp.** Rochester, New York

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PUBLISHED MONTHLY

The only technical journal in the world solely devoted to the theory and practice of Automobile Construction.

Among the subjects dealt with are: Chassis Design; Engine Design; Parts and Accessories manufacture; Metals; Machine tools; Fuels; Shop practice; Works organization and equipment.

Each issue contains invaluable information for manufacturers, designers and departmental managers.

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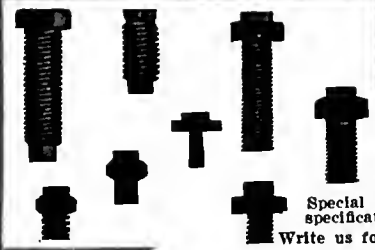
The Publishers: **ILIFFE & SONS, Ltd.** 20 Tudor Street, London, E. C. Subscriptions to this paper may be sent to The Glass Journal Co., 289 West 39th Street, New York.



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American Made for American Trade  
QUALITY FIRST  
THE NEW DEPARTURE MFG. CO.  
CONRAD PATENTS LICENSEE  
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## IRIDIO-PLATINUM TIPPED SCREWS and RIVETS



Standard Sizes

of these high-grade Screws and Rivets carried in stock. Secretly welded Iridio-Platinum beads. The best and most serviceable.

Special styles made to order—any specifications, any degree of hardness.

Write us for prices and full information.

**R. & H. PLATINUM WORKS**  
of The Rocasler & Hasslacher Chemical Co.  
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SYRACUSE · N · Y.

**DIFFERENTIALS BROWN—LIPE CHAPIN—CO.**




**Red Head**  
Reg. U. S. Pat. Off.

Puts the "Punch" into the Motor Takes the "Kick" out of the Motorist.

**SPARK PLUGS**

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of the Automobile Industry

*For Second-Hand Cars, Surplus Parts, Accessories, Tires  
Machinery & all other Special Announcements of a Similar Character*

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Conn Rod (Half) .....	\$.50
<b>Herrshoff M/20</b>	
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<b>Warren Detroit</b>	
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Conn Rod (Half) .....	.75
C. S. Front (Half) .....	1.00
<b>Lion 40 H.P.</b>	
Conn Rod (Half) .....	.90
<b>Cole 1911</b>	
Front C. S. (Sleeve) .....	2.75
Rear C. S. (Sleeve) .....	3.00
<b>Oakland 1912</b>	
Front C. S. (Sleeve) .....	2.60
Rear C. S. (Sleeve) .....	3.10
<b>Continental M/C</b>	
Conn Rod (Half) .....	.70
<b>Matheson</b>	
C. S. Front (Half) .....	1.75
C. S. Rear (Half) .....	2.00
<b>Bergdoll M/30</b>	
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We also carry Bearings to fit the following cars:

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- Hudson
- Grabowsky Truck
- R. C. H.
- Oldsmobile M/42
- Alco Taxicsb
- Abbott 30 and 44 H. P.
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**Bearings listed are in stock for immediate delivery.**

**Absolutely Brand New Parts, We do not handle Junk.**

If you have trouble in getting Bearings to fit your crankshaft, which has been turned down, send us sample of what you require with Micrometer Measurements of part, and we will make same and ship within 24 Hours after receipt of sample; we only use Parsons White Brass, No Babbitt.

**Bulletin No. 2**

**J. C. Gorey & Co.**  
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**Auction Stock  
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Prest-O-Lite Tanks .....	\$6.00
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Stewart Vacuum Tanks .....	5.00
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3/8 in. Mosler Spark Plugs .....	.25
8-in. Electric Headlights (pair) .....	2.00
Electric Tail Lights .....	.90
Reliners all sizes .....	1.00
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New Fresh Stock adjustable on 3500 mileage basis.		Used tires and tubes taken from wrecked automobiles adjustable on 1500 mileage basis.	
Tires	Tubes	Tires	Tubes
28 by 3... \$6.00	\$1.50	\$3.00	\$1.00
30 by 3... 6.50	2.00	3.50	1.10
30 by 3 1/2... 8.00	2.25	4.25	1.25
31 by 3 1/2... 8.50	2.50	4.90	1.25
32 by 3 1/2... 9.00	2.40	5.25	1.40
34 by 3 1/2... 9.15	2.45	5.50	1.50
36 by 3 1/2... 10.75	2.65	6.25	1.50
30 by 4... 9.20	2.80	6.50	1.50
31 by 4... 11.75	2.75	6.25	1.55
32 by 4... 11.05	2.90	7.00	1.55
33 by 4... 12.60	3.00	7.25	1.60
34 by 4... 18.10	3.15	7.75	1.60
35 by 4... 13.50	3.35	7.25	1.70
30 by 4... 14.00	3.45	7.50	1.75
37 by 4... 18.25	3.75	8.70	1.85
34 by 4 1/2... 16.00	3.85	7.90	1.75
35 by 4 1/2... 10.50	3.90	7.90	1.80
36 by 4 1/2... 16.80	4.00	8.00	1.85
37 by 4 1/2... 17.25	4.15	9.25	1.90
35 by 5... 16.40	4.45	8.00	1.90
36 by 5... 17.80	4.55	9.10	2.00
37 by 5... 19.85	4.85	9.50	2.10
37 by 5 1/2... 20.70	5.85	11.50	2.75

10% more for non-skid

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Maxwell 4-35  
Flanders "Six"  
Stoddard-Dayton  
Everitt  
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Courier-Car  
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Sampson "35" Motor Cars  
Alden-Sampson Trucks

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Buick D	30.50	Maxwell Mascot	33.00
Buick 37	36.80	Siaver	36.00
Buick 36	36.80	Elmore 37	30.50
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Liberty	25.00	Colby	25.00
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Milwaukee 4-cyl. 40 H.P. power plant with transmission	\$175.00
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Advertisers in this section have facilities at their disposal to take on additional work on contract  
 AUTOMOBILE SPECIALTIES OF ALL KINDS MANUFACTURED ON CONTRACT BASIS  
 SPECIAL MACHINERY - PRESS WORK - AUTO MACHINE WORK  
 FOUNDRY WORK - AUTOMATIC SCREW MACHINE WORK

Advertising Rates on Request

As a result of a constant demand for a Contract Work Section, The Class Journal Co. takes pleasure in announcing the establishing of such a department.

**THE DAYTON AUTO PARTS COMPANY**  
 FOR ALL CARS

Transmission and Differential gears, piston pins, standard and over sizes.

**VALVES**

Also a full line of parts for Stoddard Dayton Cars.

351-355 West 52nd St.,  
 New York.

The Class Journal Company,  
 239 West 39th St.,  
 New York City.  
 Gentlemen:

By establishing a Contract Work Section in your three weekly magazines, viz., The Automobile, Motor Age and Motor World, you are filling a long-felt want for the automobile industry, therefore let us compliment you on your progressiveness.

Very truly yours,  
 The Dayton Auto Parts Co.,  
 Charles E. Holste, Pres.

**SMALL HIGH-GRADE MACHINE WORK**

1/2" down to .010 small press work and manufactured parts. Specialties in all metals for Auto and Electrical Trade.

CHAS. NOBS & SON,  
 156A. ASTOR ST. NEWARK, N. J.

**FIELDCO**

Leather, Paper and Fibre Washers and Packings

All shapes All sizes for all classes of automobile work Samples and quotations promptly submitted upon receipt of specifications.

R. B. Field & Co. Worcester, Mass.

**GENERAL MACHINE WORKS**

Contract Manufacturers of Gears, Machine Parts, Machine Assembling, Jigs, Fixtures and Tools

We want to quote prices. Send blue-prints

**GENERAL MACHINE WORKS**  
 York, Pa.

**Mechanical and Electrical Automobile Parts and Accessories Manufactured**

Stampings, Screw Machine Products, Moulded Composition Work

Let Us Figure on Your Blue Prints.

Higginson-Gibson Mfg. Co., Boston, Mass.

**INVENTORS**

We specialise in manufacturing new patented articles, make models, dies and do experimental work.

Leo J. Gerding Mfg. Co.,  
 Dept. 1, Opera Place, Cincinnati, O.

**SERVICE PARTS GEARS—SHAFTS**

We manufacture and distribute the following parts: Transmission Gears, Countershafts, Slide Shafts, Differential Gears, Axle Shafts, Piston Pins, etc.

**SERVICE GEAR & MACHINE CO.**  
 Reading, Pa.

**Toolmakers for the Particular Tools of Every Description**

Jigs, gauges, all types of cutters, dies, punches, etc.

Special Machinery designed and built. Estimates Given.

**DOVER-McDEVITT**

80 Clifford St. Providence, R. I.

**SEND YOUR ORDERS**

FOR

**DROP FORGINGS**

TO

**John Obenderger Forge Co.**  
 Westalls, Wis.

**CONTRACT MACHINE WORK AND PARTS**

**GENERAL MACHINERY CO.**  
 227 Eddy Street Providence, R. I.

**If You Want PARTS**

Of Any Kind Manufactured

Communicate with THE INTERESTS

back of this advertisement, stating your requirements, as we are so situated to serve you to advantage. Address Box C710, care of Contract Dept., The Automobile.

**AUTOMOBILE Body sheets**  
 Also materials for Tanks, Hoods, Guards, Fenders, Radiators, Frames, Etc. "THURITE" Deep Drawing Stock, Enameling and Japanning Stocks, Roofing Products, Etc.  
**AMERICAN SHEET AND TIN PLATE COMPANY, Frick Bldg., Pittsburgh, Pa.**

**CULLMAN Sprockets and Differentials**  
 In stock and to order. Send for Catalog.  
**CULLMAN WHEEL COMPANY**  
 1347 Altgeld Street, Chicago

**ENGINEERS**  
 Are you having trouble with springs?  
 50 years' experience in designing and manufacturing commercial vehicle springs.  
**THE E. R. MERRILL SPRING CO.**  
 526-532 W. 28th Street New York City  
 Established in 1863

**"Zones of Quiet"**  
 Send us your Blue Prints or Sample Gears for estimates  
**ALBAUGH-DOVER CO., 2100 Marshall Blvd., CHICAGO**  
**GEARS**

Please mention The Automobile when writing to Advertisers



# When Time Counts

The thoroughness of our organization together with the size and facilities of our plant assure prompt delivery of SAE Standard Cap Screws, SAE Semi-Finished Nuts, SAE Castellated Nuts, as well as



## Automatic Screw Machine Products

When time is an important factor with you it would be well to remember this fact.

Remember! When placing an order with the Corbin Screw Corporation you are placing it with an organization qualified both by experience and capacity to fill orders in the shortest possible time with products of the highest quality.

We shall be glad to submit quotations and advice on delivery upon receipt of blue prints and specifications.

We also manufacture Cap and Set Screws, US threads, Machine Screw standard ASME, Machine Screw Nuts, Wood Screws, Stove Bolts, Tire Bolts, Thumb Screws, Thumb Nuts, etc.

## The Corbin Screw Corporation

The American Hardware Corporation, Successor  
NEW BRITAIN, CONN.

BRANCHES: New York Chicago Philadelphia

Makers of Corbin-Brown Speedometers. Also makers of Corbin Duplex Coaster Brakes for Bicycles

30  
500 10'00 15'00 20'00 25'00  
REVOLUTIONS PER MINUTE

25  
20  
15  
10  
5  
0  
BRAKE HORSE POWER

### LE ROI MOTOR

3 1/8 x 4 1/2 MODEL C

FOR THE LIGHT ROADSTER  
TOURING CAR  
OR  
TRUCK

Used by leading manufacturers of best-known American-made light trucks.  
The business of manufacturing Le Roi Engines, formerly conducted by Milwaukee Machine Tool Co., is now carried on by

## LE ROI COMPANY

Mitchell St. and 60th Ave.  
**MILWAUKEE, WIS.**

Write for Complete  
Information

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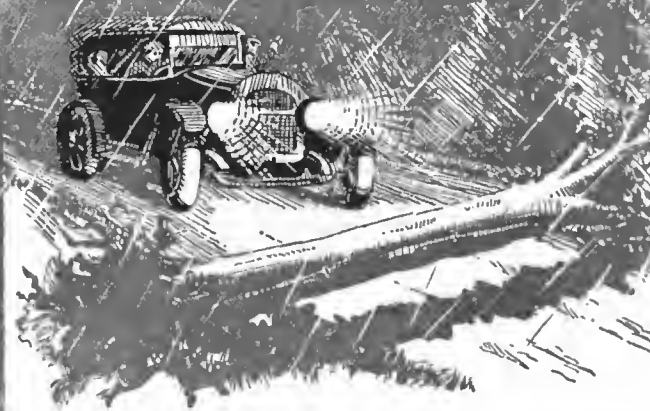
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# ALUMINUM SHEETS PURE INGOTS ALLOYS GRANULATED

**"GOOD  
INGOTS  
FOR  
PERFECT  
CAST-  
INGS"**

**United Smelting & Aluminum Company, Inc.**  
General Offices: New Haven, Conn.

## "ELEKTRA Brake Lining saved us that time"



In emergencies you've got to "call for help" on your brake linings. Upon the responsiveness of your brakes depends the safety of your car and its passengers. A good brake lining is simply good insurance. Consider it as such by getting the best obtainable—

### ELEKTRA ASBESTOS FRICTION BRAKE LINING

Made of selected asbestos, chemically combined (by a patented process) with an indestructible metal, and offering a very high coefficient of friction. That is why it will not burn, char, or slip; why oil, water or vapor has no effect upon it.  
In point of wear and service it has no superior.  
Write for sample and complete information.

**THE F. L. HORTON MFG. COMPANY**  
Whittier Street                      Boston, Mass.

Please mention The Automobile when writing to Advertisers



"AGATHON" Special Analyses  
 "AGATHON" Vanadium  
 "AGATHON" High Carbon  
 "AGATHON" Chrome Nickel  
 "AGATHON" Chrome Steel  
 "AGATHON" Chrome Vanadium  
 "AGATHON" Nickel Steel

## Toledo Yesterday; Agathon Today

In the days of the Spanish Inquisition men did all their fighting hand to hand. The chief use for steel was in cutlery, and the best steel was found in the swords forged at Old Toledo.

Today the strongest steel to withstand the strains and wear of modern usage has all the better qualities of the Old Toledo product—together with the improvements in quality which only time and experience can bring. It is—

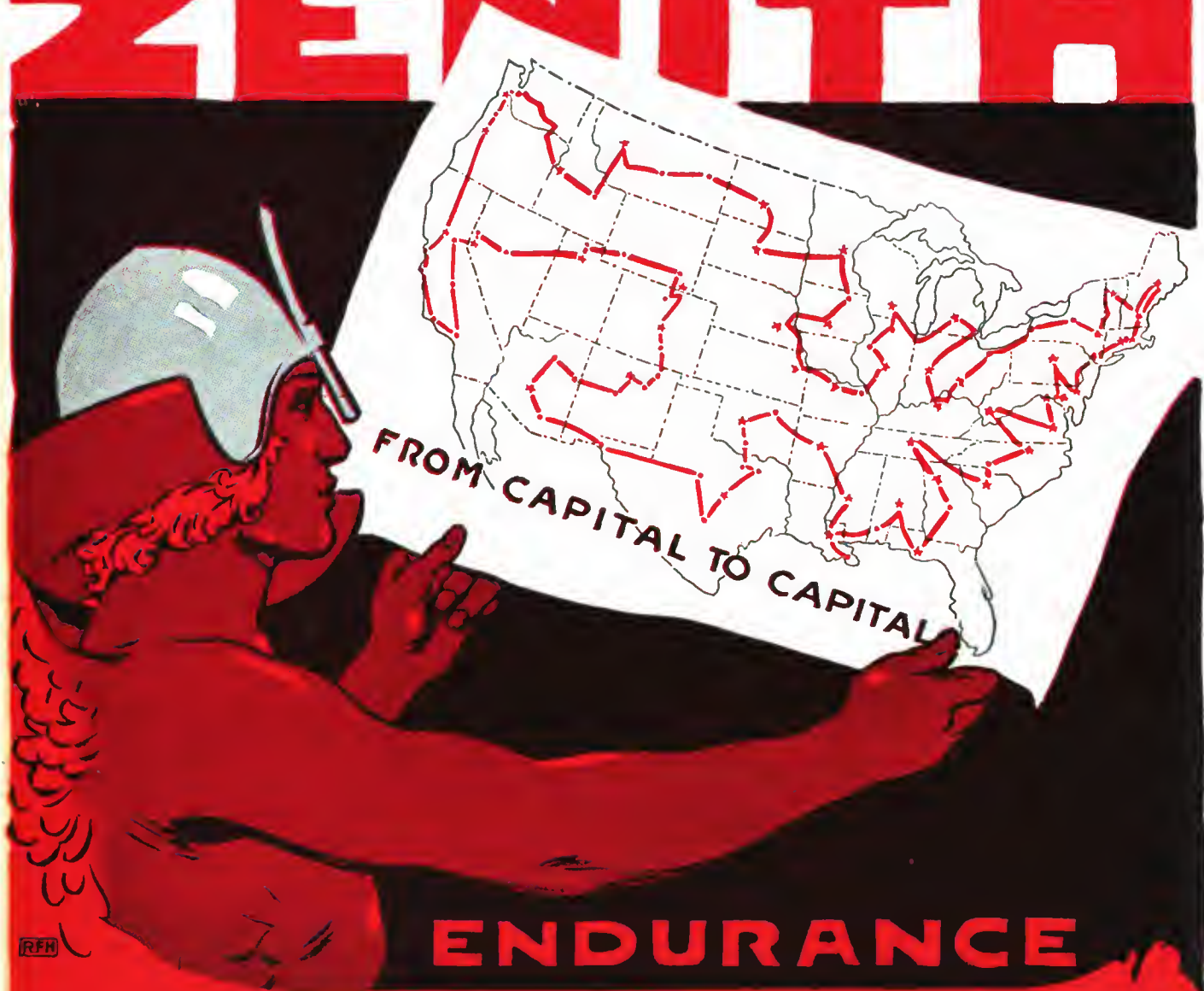
## AGATHON STEEL

**THE CENTRAL STEEL CO.**  
 MASSILLON, OHIO

DETROIT OFFICE—326-27-28 Ford Building,  
 F. Walter Gulbert, District Representative  
 CLEVELAND OFFICE—Hickox Building,  
 The Hamill Hickox Co., District Representatives  
 CHICAGO OFFICE—Room 1511-12 Lytton Bldg.,  
 14 East Jackson Blvd., A. Schaeffer, District Sales Manager  
 PHILADELPHIA OFFICE—902 Widener Building,  
 Frank Wallace, District Sales Manager  
 GENERAL EXPORT AGENTS  
 J. E. Dockendorff & Co., 20 Broad St., New York, N. Y.

Please mention The Automobile when writing to Advertisers

# ZENITH



## ENDURANCE

In August last a stock Hupmobile, Zenith equipped, left Washington, D. C.; four months later, in January, it returned—world famous—the car with its four passengers had visited the capital of every State in the Union.

For four months of continuous driving the Zenith delivered a perfect mixture of fuel and air to the cylinders, varying the quantity automatically and with absolute precision, to meet the motor's ever changing needs. Whether idling noiselessly, laboring through hub deep mud, or roaring along at full speed, the Zenith responded instantly to every demand for power, speed and economy.

20,000 miles—the very best of roads, the very worst, no roads at all. Mile on mile of burning sand and pitiless sun, weeks of drenching downpour, fogs, bottomless muck-holes and ruts; jagged, frozen roads, blizzards, fender high snow, arctic cold—through every range of temperature, humidity and altitude, with good gasoline and bad—the Zenith never failed the man at the wheel.

To Zenith's fame for simplicity, economy and dependability, must now be added this incomparable record for *endurance*.

## ZENITH CARBURETOR COMPANY

NEW YORK

DETROIT, U. S. A.

CHICAGO

# An appeal to Reason Listen to Logic

**Overland**  
TRADE MARK P. O. G.

A better motor car for less money.  
Overland success means just that to the buyer.

For five years we have outsold all cars in our class.

Last year our sales were millions of dollars ahead of any make selling over \$400.

Economies were greater — values greater than ever.

This year, through an achievement new to the American Automobile Industry, we apply the economies of vast production to the most comprehensive line of cars ever offered by any one manufacturer.

We have been working towards this end for eight years.

All the general expense heretofore charged to a single class of cars we now *distribute* over several groups, including not only low priced cars but cars in the high priced class as well.

Our dealers this year have contracted already for \$180,000,000 worth of these cars.

On this volume we will save millions of dollars in manufacturing and sales economies.

We offer a most attractive line of automobiles in the high price class—at moderate prices.

We offer dominant value in lower priced cars—greater values than ever.

There are Light Fours, Big Fours, Light Sixes and the Willys-Knight group, which includes the new Willys-Knight Eight.

Body styles; *all new*, include

- roadsters, two and three passenger,
- Country Club, four passenger sport model,
- touring cars, five and seven passenger,
- coupes, three and four passenger,
- sedans, five and seven passenger,
- and the limousine.

You will find in the Willys-Overland line an automobile of high quality, exactly adapted to your any need or pleasure.

In every class these cars represent such remarkable value that every consideration of pride, economy, safety and enjoyment must urge you to consider the Willys-Overland line first.

When the Overland dealer knows what kind and class of car is wanted he can help solve a purchaser's personal automobile problem.



### Overland Light Four Models

Roadster, 104-in. wheelbase . . . . .	\$650
Touring, 106-in. wheelbase . . . . .	\$645
Sport Model, Country Club (Illustrated) . . . . .	\$750



### Overland Big Four Models

Roadster, 112-in. wheelbase . . . . .	\$835
Touring, 112-in. wheelbase—(Illustrated) . . . . .	\$850

(See also Closed Cars)



### Overland Light Six Models

Roadster, 116-in. wheelbase—(Illustrated) . . . . .	\$970
Touring, 116-in. wheelbase . . . . .	\$945

(See also Closed Cars)



### Willys-Knight 7-Passenger Models

Four Cylinder Touring, 121-in. wheelbase . . . . .	\$1285
Eight Cylinder, 125-in. wheelbase (Illustrated) . . . . .	\$1950

(See also Closed Cars)

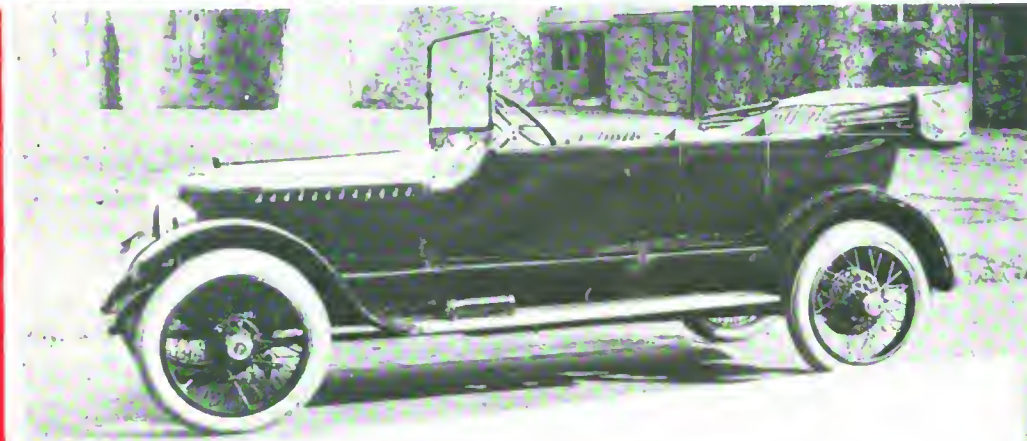


### Overland and Willys-Knight Closed Cars

Overland Big Four Coupe, 112-in. wheelbase . . . . .	\$1250
Overland Big Four Sedan, 112-in. wheelbase . . . . .	\$1450
Overland Light Six Coupe, 116-in. wheelbase . . . . .	\$1385
Overland Light Six Sedan, 116-in. wheelbase (Illustrated) . . . . .	\$1585
Willys-Knight Four Coupe, 114-in. wheelbase . . . . .	\$1650
Willys-Knight Four Sedan, 121-in. wheelbase . . . . .	\$1950
Willys-Knight Four Limousine, 121-in. wheelbase . . . . .	\$1950

All prices f.o.b. Toledo  
Subject to change without notice

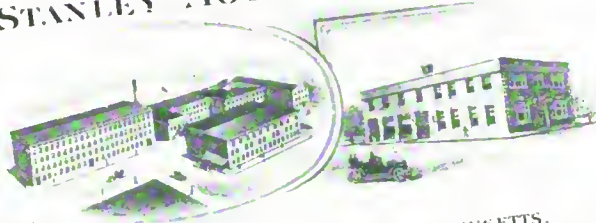
The Willys-Overland Company, Toledo, Ohio  
Manufacturers of Willys-Knight and Overland Automobiles and Light Commercial Cars  
"Made in U. S. A."



FOUNDED 1898  
**STANLEY MOTOR CARRIAGE CO.**

WORKS AND OFFICES  
 AT NEWTON,  
 MASSACHUSETTS

BRANCH AT  
 2125 CHESTNUT ST.  
 PHILADELPHIA



BRANCH AT  
 185 COMMERCIAL ST.  
 WORCESTER, MASS.

BRANCH AT  
 2101 INDIANA AVE.  
 CHICAGO, ILLINOIS

BRANCH AT  
 1523 CHEYENNE PLACE  
 DENVER, COLORADO

PLEASE ADDRESS THE EN-  
 CLOSURE TO AN  
 EMPLOYEE AT WHOM YOU CAN  
 BE REACHED IN HIS ABSENCE

NEWTON, MASSACHUSETTS. Dec. 29, 1916.

Houk Manufacturing Co., Inc.,  
 1700 Elmwood Avenue,  
 Buffalo, N. Y.

Gentlemen:-

We used a considerable number of Houk wire wheels on our 1915 and 1916 cars, as special equipment. The specifications for this equipment in previous years. Almost invariably those who have had wire wheels on earlier cars are specifying them on their new cars.

We ourselves, are firm believers in wire wheels just as we have always been. You remember how we resisted the advance of the wooden or "artillery" wheel. You remember we continued to use wire wheels exclusively until about 1904 or 1905, and even as late as 1908 we offered wire wheels with regular equipment on our roadster model.

On the mere basis of strength for weight we believe in the Houk wire wheels. Add to this the fact that a considerable weight is saved and this weight is below the springs -- unsprung weight -- and that the tire change is considerably quicker and neater with Houk wire wheels, even than with demountable rims, and you will see that we are pretty strong believers in Houk wire wheels.

Faithfully yours,

STANLEY MOTOR CARRIAGE COMPANY

*Thasco Warren*  
 Vice President.

PW H



**HOUK**  
 QUICK CHANGE  
**WIRE WHEELS**

# ***THE STANDARD PARTS COMPANY***

## ***Manufacturers of Essential Parts for Automobiles***

***Stanweld Rims***

***Perfection Springs***

***Stanweld Cold Drawn Seamless Steel Tubing***

***Perfection Heaters***

***Motor Truck Bands***

***Tire Bases***

***Brake Rods***

***Aeroplane Rims***

***Motorcycle Rims***

***Bicycle Frame-Parts***

***Motorcycle Frame-Parts***

***Tubular Parts for Motor Vehicles***

# **THE STANDARD PARTS COMPANY**

**"Spring Division"**

**Central Avenue**

**"Rim and Tube Division"**

**Edgewater Park**

**CLEVELAND, OHIO**

Stanford Library  
SEP 17 1938  
B

# The AUTOMOBILE

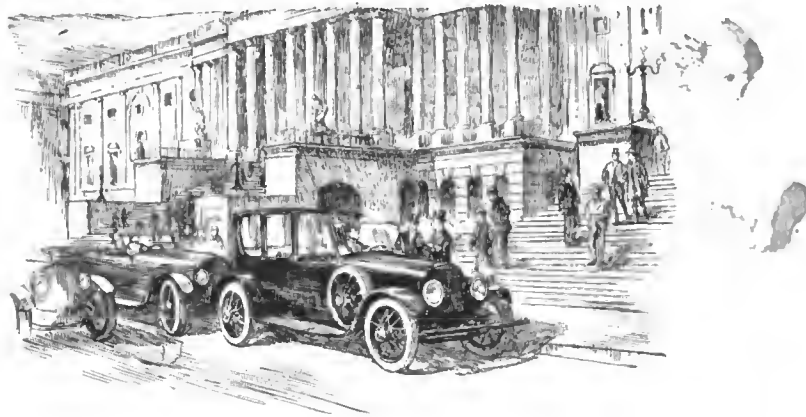
Vol. XXXVI  
No. 18

NEW YORK, MAY 3, 1917

Ten cents a copy  
Three dollars a year



*Maud L'Anphere Crook*



## AT THE NATION'S SERVICE

For war or peace the motor vehicle assures the nation a mobilizing power of incalculable importance. Millions of pleasure cars and trucks are equally at the nation's service whether their work be the arts of peace or the armed defense of America.

Readiness is typical of the motor vehicle; it is the indispensable quality of truck and pleasure car alike. Hundreds of thousands of owners, many thousands of dealers, and more than one hundred and sixty manufacturers have learned how especially dependable is the Continental-powered vehicle. Everywhere recognized as America's leading motor, the Continental stands today in readiness for any call. Upon demand, Continental Power will serve you and our nation alike.

### CONTINENTAL MOTORS CORPORATION

Offices: Detroit, Michigan      Factories: Detroit—Muskegon

*Largest exclusive motor manufacturers in the world.*







# KING EIGHT

60 Horse Power



### The King may be the car you are looking for

It is an automobile sufficiently reliable under severe official road tests to have its chassis adopted by the U. S. Army and Marine Corps for armored cars, though it shares this honor with several other good makes of cars, some of higher price. It is built by a long established company with a reputation for good cars and fair dealing, ranking high among a number of worthy competitors. The King is a car which may be conservatively described as economical, and is one that "handles"

easily, having an all-round road competence which has surprised and delighted many. In all, we believe the King Eight does offer a quite remarkable combination of power, economy, reliability, comfort and style which, considered with the price, makes it a purchase absolutely safe for anybody, one thoroughly consistent with our slogan "The Car of No Regrets." Foursome, (shown above) \$1700; Touring, \$1650; Sedan, \$2300; Roadster, \$1585. All 60 H. P.

KING MOTOR CAR COMPANY DETROIT

Please mention The Automobile when writing to Advertisers

# WORLD'S RECORD 106.71 Miles Per Hour

## AITKEN driving Peugeot, using OILZUM, Won

Coney Island Cup Race, May 13, 1916, 20 miles, averaging 106.71 m. p. h.

Harkness Gold Trophy Race, October 28, 1916, 100 miles, averaging 105.95 m. p. h.

Astor Cup Race, September 30, 1916, 250 miles, averaging 104.83 m. p. h.



OILZUM, due to its exceptionally high flash-test resists the heat and remains and lubricates longer and better than other oils, thus greatly reducing oil consumption and, consequently, minimizing carbon troubles.

OILZUM is just naturally the only perfect oil for high speed motors.

If you want your motor to be always tuned up to concert pitch you should insist upon OILZUM, the oil used by the world's greatest race drivers and aviators (men who know good oil).

# INSIST ON Oilzum MOTOR OIL

MANUFACTURED BY  
**THE WHITE & BAGLEY COMPANY**  
WORCESTER, MASS. U.S.A.

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 Denver Oil Company, Denver, Colo.  
 Universal Auto Company, Hartford, Conn.  
 The Jordan Auto Company, Willimantic, Conn.  
 Stewart Wholesale Co., Boise, Idaho.  
 Wilcox & Herr, Inc., Indianapolis, Ind.  
 Western Auto Specialty Co., Iowa City, Iowa.  
 Bennett Auto Supply Co., Sioux City, Iowa.  
 Darling Automobile Company, Auburn, Me.  
 Darling & Kidder Co., Portland, Me.  
 Green & Swett Co., 821 Boylston St., Boston, Mass.  
 The Tarbell-Watters Co., Springfield, Mass.  
 Kansas City Automobile Supply Company, Kansas City, Mo.  
 The G. C. Hall Company, Billings, Montana.  
 The Francis Motor Sales Co., Milford and Oneonta, N. Y.  
 Whittemore-Sim Co., 1976 Broadway, New York, N. Y.

A. H. Marshall Co., Inc., Plattsburg, N. Y.  
 G. M. Toe Water & Co., Cincinnati, Ohio.  
 Rasmussen & Company, Portland, Ore.  
 Cahall Motor Supply Co., S. W. Cor. Broad and Parrish Sts., Philadelphia Pa.  
 Goodby-Rankin Company, 57 Washington St., Providence, R. I.  
 The Cameron & Barkley Co., Charleston, S. C.  
 Merchants Auto Storage Co., 18 So. Fourth St., Memphis, Tenn.  
 W. T. Wroe & Sons, Austin, Tex.  
 Sanders Bros. Co., Richmond, Va.  
 Comet Motor Co., Ltd., Montreal Quebec.  
 James S. Neill & Sons, Ltd., Fredericton, N. B.  
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 John Danks & Son, Pty., Ltd., 391-403 Bourke St., Melbourne, Anstralia  
 Cornell, Limited, Adelaide, South Australia.  
 Empire Oil Co., Wellington, New Zealand.  
 The F. W. Horne Co., Tokyo, Japan.

Please mention The Automobile when writing to Advertisers

**The AUTOMOBILE**  
 THE CLASS JOURNAL COMPANY  
 231-241 W. 39th STREET NEW YORK CITY  
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During the first months of 1917  
Studebaker shows a marked increase  
over the same period in 1916

<b>Missouri</b>	<b>-</b>	<b>53.6%</b>	<b>Increase</b>
<b>Iowa</b>	<b>-</b>	<b>34.6%</b>	<b>"</b>
<b>Kansas</b>	<b>-</b>	<b>184.2%</b>	<b>"</b>
<b>Arkansas</b>	<b>-</b>	<b>41.5%</b>	<b>"</b>
<b>Nebraska</b>	<b>-</b>	<b>64.8%</b>	<b>"</b>

Dealers all over the country are making money with Studebakers.

Dealers in rural communities, where the trading is principally with farmers, are prospering, because for 65 years farmers have known that the name Studebaker stands for Quality and Value.

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# The AUTOMOBILE

VOL. XXXVI

NEW YORK—THURSDAY, MAY 3, 1917—CHICAGO

No. 18

## Oppose Unjust Taxation!

**Entire Industry Should Oppose Proposed 5 Per Cent Tax on Car Sales at Factories— Industry Willing to Give Its Share of War Taxes But Such Class Taxation Is Unfair— Tax Cannot Be Passed to Consumer To-day**

WASHINGTON, May 2—The proposed tax of 5 per cent on the total sale of automobiles by the manufacturers, which has been put forward as one of the taxation measures to raise \$1,800,000,000 war funds, is being opposed by the automobile makers and the industry in general on the ground that this particular form of tax is class legislation and takes the form of a poll tax on a percentage of the people. It has been suggested by certain Washington officials that should the tax become a law it might possibly be declared unconstitutional on these grounds.

### Industry Will Pay Its Share

As soon as war taxation measures were proposed the automobile industry expected to stand its share of just inequitable taxation and is prepared to do so to-day, but this particular 5 per cent tax which manufacturers must pay on the selling price of each car is considered grossly unfair by the leaders of the industry and as a consequence the entire industry should unite in opposing the progress of the measure through Congress and the Senate.

Latest reports from Washington indicate that the inability of the House Ways and Means committee to agree on the provisions of the war revenue bill is resulting in a deadlock. One of the most important factors in this situation is the proposed 5 per cent tax on automobiles.

Alfred Reeves, general manager of the National Automobile Chamber of Commerce, has been in Washington to aid in protecting the automobile manufacturers in this matter. The question is now before a sub-committee of the Ways and Means Committee of the House. This sub-committee will make its report to the Ways and Means Committee, which may be done any day.

The Ways and Means Committee of the House will have to approve the measure as a whole or by a majority. This done, the bill is then brought before the House of Congress.

If passed by Congress, the bill then goes to the Finance Committee of the Senate, which has Senator Simmons of North Carolina as chairman, and he cannot be considered in any sense a supporter of the automobile industry in this matter. The automobile industry has one favorable representative on the Senate Finance Committee in the person of Senator Townsend of

Michigan, who, it is expected, will look after the interests of the automobile industry to see that grave injustices are not done it in this matter.

Once out of the Senate Finance Committee, the measure next goes to the Senate for the vote.

### Write Your Congressman

Every automobile manufacturer and every automobile dealer and garage-man should immediately do his part in opposing this 5 per cent tax on automobiles at the factory. The only way to register such opposition is to write your Congressman, opposing the measure on the ground that it is class legislation.

The automobile industry feels positive that it is not possible to pass this 5 per cent tax on to the consumer as it is generally supposed will be done. This is no time for such action. Such a course might have been followed when prices of tires were being reduced, but to-day, when an \$800 car is selling for \$1,050, there is no possible chance of passing an additional 5 per cent on to the consumer.

There could be no more unfortunate time to have the price of automobiles increased than at the present. Already retrenchments are being made in the purchase of automobiles throughout the country. Thousands of owners of used cars who contemplated buying new ma-

*(Continued on page 860)*

## \$160,000,000 for War Transportation— \$3,900,000 Additional for Armored Cars

Large Government Appropriation Reported—\$5,539,965  
for Military Roads, Etc.—Advice from Allies' Officers—  
Long Service Expected—Acid Test for Motor Vehicles

WASHINGTON, May 1—The first great war budget, a bill making available \$2,699,485,281.18 for the estimated cost of the first year of the war with the German Government, was reported yesterday by the Appropriations Committee. Of this sum, \$160,000,000 is set aside for transportation purposes alone, from which the principal allowances for trucks and automobiles will come.

Armored cars will receive \$3,900,000 additional, \$750,000 additional is appropriated for anti-aircraft guns and \$1,640,000 for ammunition for the latter.

Special attention is to be given the matter of military roads by the War Dept. Roads, walks, wharves and drainage alone will receive \$5,529,965. The greater part of this will be spent for roads.

For transportation and recruiting of the Marine Corps, \$1,731,600 is provided. For the immediate purchase and equipment of sites for the permanent establishment of aviation schools, aviation posts and experimental aviation stations and proving grounds \$9,000,000 is made available, \$2,500,000 of which may be used in purchasing land.

### Money for Airship Repair

The sum of \$47,267,766 has also been appropriated for the office of chief signal officer. For the purchase, manufacture, maintenance, operation and repair of airships and other aerial machines and accessories necessary in the aviation section, \$43,450,000 has been set aside. This money will also be used for the maintenance of automobiles and equipment-carrying vehicles for the aviation section.

In addition to the amount provided in the bill for aviation activities, the sum of \$11,000,000 is provided for aviation in the navy. Numerous small items for motor vehicles are also included in the bill.

The experiences of Great Britain and France with heavy motor apparatus are being drawn upon in connection with plans in the making for the best possible utilization of these factors by the War Dept. These plans, on which experts of the army officers assigned for duty in connection with the Council of National Defense heads are engaged, include the adaptation of motor trucks, tanks, armored cars of different designs, etc., to the varied uses and conditions which will confront the army once it is in the field. In fact, every possible contingency is being provided for insofar as this is possible.

Plans are being made upon the theory that the increased army will see extreme service and under extreme conditions. In the making of these plans valuable suggestions are being obtained from English

and French army officers now in this country with the British and French commissions. The acid test is to be given every piece of motor apparatus bought by the government.

### English Aeroplanes for Commercial Purposes

LONDON, April 26—Great Britain is planning to use aviation in trade. This announcement was made in the House of Commons to-day by Major J. L. Baird, representative in the House of the Aerial Advisory Board. The Government has decided to appoint a committee under the chairmanship of Lord Northcliffe to investigate civil aerial transport after the war.

This committee would consider and report on steps to be taken for the development and regulation after the war of aviation for civil and commercial purposes from domestic, imperial and international points of view, and the extent to which it would be possible to utilize the trained personnel and the aircraft which at the conclusion of peace would be available.

The output of aeroplanes has been increased greatly during the last few months, and a greater increase is expected. Taking the monthly average output for the last year as the imaginary figure of eight, the output for the first 2 months of this year would be represented by sixteen, and it is expected that by the end of the year it would be represented by thirty-eight.

### How Allies Fight in Air

WASHINGTON, D. C., April 30—The British and French flying corps are in complete control of the air over the Western front, according to Major L. W. B. Rees of the British flying corps. In describing the maneuvers of the battle squadrons, Major Rees said that the British fly on three levels with three kinds of machines. The lowest are the artillery directors, who circle about in big figure eights about 600 ft. above the enemy trenches and flash back directions to the British gunners by wireless. Above them, at 10,000 ft., are the heavy fighters with two men to a machine and able

to keep the air for 4 hr. at a speed of 110 m.p.h. At a height of 15,000 ft. are the single-man light fighters, capable of 130 m.p.h. and of ascending the first 10,000 ft. in 10 min. British losses above the foe's lines have reached thirty to forty machines a day.

### Waldon and Hutton Plan Aeroplane Output

DETROIT, May 1—It is reported that Sidney D. Waldon, former chief engineer of the Packard Motor Co. and William H. Hutton, former purchasing agent of the Timken-Detroit Axle Co., have arranged with competent builders for the government to obtain aeroplanes at the rate of 640 in 1917, 2400 in 1918, and 5500 in 1919.

### To Examine Joy Field

DETROIT, May 2—Major Benjamin Foulois of the Aviation Corps will examine the Joy field, which the war department has practically decided to acquire.

### Automobile Men Receive Commissions

WASHINGTON, May 2—Henry Souther, past-president of the S. A. E. and recently consulting engineer, Office of the Chief Signal Officer in the War Department, is to be commissioned a major in the aviation corps.

S. D. Waldon, formerly connected with Packard and Cadillac and for some time past active in government aviation work, has been commissioned a captain in the aviation section of the Signal Corps.

W. H. Hutton, former Timken-Detroit Axle Co. purchasing agent, has been commissioned a major in the quartermaster's department, where he will probably have to do with the inspection and purchase of motor trucks. S. P. Wetherill, Jr., administrative and chemical engineer, has also been made a major in the same work as Mr. Hutton.

### New Six-Cylinder Abbott

CLEVELAND, May 1—The Abbott Corp. is adding a six-cylinder model called the 6-60 using the 7-N Continental engine and Warner transmission. Prices are as follows:

Seven-passenger touring .....	\$1,595
Four-passenger roadster .....	1,555
Two-passenger speedster .....	1,595
Four-passenger Springfield, Inclosed...	2,100
Five-passenger sedan .....	2,150

Features of the car are a mahogany cowl, nicked copper instruments, front and rear bumpers and Boyce Moto-Meter as standard equipment. A 5½ in. frame will be used.

## 5 Per Cent Automobile Tax

Read the article "Oppose Unjust Taxation!" appearing on page 845 of this issue which tells why you should oppose this class taxation. After reading it do your part by writing your congressman in Washington, registering your opposition to this tax on the ground that it is class taxation.

## Auditorium for S. A. E. Meeting

### Bureau of Standards Offers Facilities for Summer Session—Informal Dinner June 26

WASHINGTON, D. C., May 1—The Bureau of Standards, under the direction of Dr. Stratton, has advised that its auditorium and other necessary parts of the bureau will be at the disposal of the Society of Automotive Engineers for its Summer Meeting, Monday and Tuesday, June 25 and 26. The bureau has been co-operating with the society in many ways connected with standardization work and this courtesy is another example of how desirous the Government is to work with the engineers.

The meeting on Monday, June 25, will be given over entirely to the work of the Standards Committee.

Tuesday, June 26, will be occupied by the general work of the society, including a business meeting in the morning, receiving of reports, and professional papers in the afternoon.

F. E. Moskovics has accepted the chairmanship of the committee for the informal dinner Tuesday evening, June 26. The exact place at which this dinner will be held has not yet been decided upon. Mr. Moskovics is in the city this week arranging for the dinner and adding to his committee to handle this work.

### S. A. E. Starting and Lighting Committee Named

DETROIT, April 27—Members of the starting and lighting batteries division of the standards committee of the Society of Automotive Engineers, of which G. E. Goodard, assistant engineer Dodge Brothers, is chairman, include W. H. Palmer, Electric Storage Battery Co.; W. H. Conant, Gould Storage Battery Co.; R. J. Nightingale, Willard Storage Battery Co.; J. V. Whitbeck, Chandler Motor Car Co.; R. H. Combs, of the Prest-O-Lite Co., and W. L. Bliss, of the United States Lighting & Heating Corp.

### Vital Mfg. Co. Now

CLEVELAND, April 28—The Vital Mfg. Co. is the new name of the Bigsby Rotary Mfg. Co. The concern produces a spark plug.

### Hinkley Heads Detroit S. A. E.

DETROIT, May 2—At a meeting held last night of the Detroit section of the Society of Automotive Engineers, C. C. Hinkley, chief engineer of the Chalmers Motor Co., was elected chairman; F. H. Whitten, chief engineer of the General Motor Truck Co., vice-chairman; W. B. Stout, aircraft engineer of the Packard Motor Car Co., secretary; G. M. Holley, Holley Brothers, treasurer; O. E. Hunt, chief engineer of the body division of the Packard Motor Car Co., chairman of the meetings committee; W. H. Oliver,

Jr., Chalmers Motor Co., chairman of membership committee; C. Van Sicklen, Van Sicklen Speedometer Co., chairman of ways and means committee, of which there are three divisions:

Social Division, chairman, H. A. Brown, Hyatt Roller Bearing Co.  
Publicity Committee, chairman, B. G. Koether, Hyatt Roller Bearing Co.  
Sections Meeting Committee, chairman, H. E. Butcher, manufacturers' representative.

Mr. Hinkley has introduced a new plan for securing papers which will insure important and valuable information to the members of the organization by the inauguration of an industrial research committee, H. M. Jerome, Chairman, which has five divisions. These are: R. H. Sherry, chief chemist of the General Motors Co., chairman of mechanical and metallurgical research; F. M. Holden, Cadillac Motor Car Co., laboratory testing; H. M. Jerome, Chalmers Motor Co., chairman of inspection; George C. McMullen, Timken-Detroit Axle Co., chairman of planning and mechanical efficiency; Paul E. Kelecon, Cadillac Motor Car Co., chairman of body design.

### British and French Engineers Appreciate S. A. E. Co-operation Offer

NEW YORK, May 2—Some days ago the Society of Automotive Engineers forwarded a cable to the Institution of Automobile Engineers in England and also to the Automobile Club of France offering assistance by way of tractor information, etc., in connection with the present food conservation problem. A reply has been received from Basil H. Joy, Secretary of the Institution of Automobile Engineers, London, thanking the society for its offer and soliciting the co-operation of the S. A. E. in the quicker production of farm tractors for Great Britain and also in many other matters with regard to same.

The cable forwarded by the S. A. E. follows:

"The Society of Automotive Engineers, formerly Society of Automobile Engineers, extends its congratulations to the Automobile Club of France (Institution of Automobile Engineers) on its able service in assisting its Government in motor transportation and kindred activities. We consider the farm tractor one of the most potential elements in solving the food problem. Our membership includes tractor engineers of all leading manufacturers, much tractor experience and information is at our command, and in extending our brotherly sympathy and co-operation in the common struggle for democracy we formally place all our data at your disposal and would be honored to collaborate in any way you desire. Standardization in farm tractor manufacture as well as in airplane and motor boat manufacture is being pushed vigorously and other activities are being forwarded aggressively. Command our assistance as you desire in the food increase work."

### 500 New S. A. E. Members

NEW YORK, May 2—Whether the Society of Automotive Engineers succeeded in obtaining 1000 new members during its April campaign, is not yet known. To date 484 applications for membership have been received, but unquestionably several hundred are being circulated for the necessary number of signatures and will not reach the office for some days. It will be perhaps the middle or near the end of May before the exact success of the campaign is definitely known.

## S. A. E. Insures Close Co-operation

### Washington Office to Keep in Touch with Government—Members at Capital

WASHINGTON, May 1—Arrangements are practically complete for the Washington offices of the Society of Automotive Engineers in the Munsey Building, where it will be conveniently located with regard to the Council of National Defense. Howard E. Coffin, past-president of the society, and one of the leading activity centers of the Council of National Defense, has the matter under his direction and it is certain the society will be well cared for.

K. W. Zimmerschied, past-chairman of the Standards Committee and metallurgist, General Motors Corp., is spending practically all of his time in Washington, and it is expected will have complete charge of the Washington office. It is expected that many other members of the Society who are spending a good deal of time in Washington will cooperate so that the office will be a real information center for S. A. E. members.

President George W. Dunham, owing to his appointment on the board for the development of automotive apparatus for moving field artillery, will spend a good deal of time in Washington. Coker F. Clarkson, general manager of the S. A. E., also expects to spend much time in Washington. S. D. Waldon has been making headquarters with the Council of National Defense for some months and can assist. The Washington office should prove a particularly popular center.

Through it the Society aims to keep in very close touch with not only the War and Navy departments, but also the department of Agriculture, which is deeply interested in the farm tractor.

The office will continue to give special attention to the standardization of products vital to the present war, to the work of the motor transport committee, and to other important activities of the Government.

Howard E. Coffin, discussing the work which the S. A. E. has done in assisting in preparations for the conduct of the war, said the value of this assistance to the Government could not be overestimated. The wide experience and great technical knowledge of the S. A. E. membership has been put in command of the Government freely, practically without condition, to the great benefit of the nation and, according to Mr. Coffin, no other organization will be found giving more cheerfully of its efforts during the war to greater advantage to the Government than the S. A. E.

### Wins Argentine Parade Prize

ROSARIO, ARGENTINA, March 30—J. M. Johnson, Studebaker dealer in this city, won first prize for the best decorated automobile in a large parade held here recently.



## Standards Committee Meets

### Research Division Reports on Acceleration Tester—Aero Division Progressing

CLEVELAND, May 2—The meeting of the various divisions of the Standards Committee of the Society of Automotive Engineers started here to-day and to be continued to-morrow, is not as largely attended as was anticipated on the opening day, but it is expected that the attendance to-morrow will be much larger.

One of the most important reports presented is that of the Research Division relating to new apparatus for testing acceleration of automobiles.

It consists of an ignition breaker fitted on front wheel and paper strip moved by chronometer marking seconds. Each revolution of the wheel causes five sparks which puncture paper. Counting punctures for any second shows speed of car. It is expected this much discussed car testing report will be accepted.

Good progress has been made by the Aeronautic Division under the chairmanship of Charles M. Manly of the Curtiss company. Among the many recommendations decided upon by this division are the following:

A. The adoption of two types of control, the Deperdussin and the stick type, providing it meets with the approval of the army and navy.

B. The use of clincher rims for air-plane wheels conforming to the standards of the Clincher Automobile Tire Manufacturers' Assn., the rim sizes to be 24 by 3½, 28 by 4, and 32 by 4½. Tires of corresponding sizes are to be used.

C. Marking of fuel and oil pipe lines, fuel lines with red stripes ½-in. wide painted around the pipes and 24 in. apart; and oil lines with circular white rings ½-in. wide and 24 in. apart.

D. The use of the English system of measurement in aeroplane matters except in such isolated cases as spark plug threads where the metric system is desirable. This action is due to the fact that the army and navy departments are not both in favor of adopting the metric system.

E. The following spark plug dimensions: Thread, 18 mm., 1½ mm. pitch. The hexagon is to be 1 in. across flats.

F. Engine rotation to be defined as: "The direction of engine rotation is normal when the final power delivery member of the engine rotates anti-clockwise, viewed facing the power delivery end. Opposite rotation is anti-normal."

G. Approval of the following S. A. E. standards for aeronautic practice: Steel specifications, heat treatments, test specimens, ball bearing sizes, throttle levers, magneto dimensions, cotter pin sizes, and screws and bolts.

H. Many other standards relating exclusively to aeroplane practice were approved, including flexible cable ends, spliced, non-flexible ends, thimbles, turn-

buckles, pipe fittings, propeller hubs, etc.

The Chain Division recommended that designers of silent chain drives should use the exact nominal pitch of the chain in computing center distances for sprockets. It also recommended standards for designating width of silent chains as the width of over-all tension members, and that the maximum width of the chain over riverheads shall be this nominal width plus ½ the pitch.

The Electric Equipment Division has prepared proposed standards for flanged mountings of electric generators and starting motors. It is not intended that this type of mounting shall be standardized to the exclusion of other mountings.

The Engine Division has collected data on poppet valves which has been submitted to manufacturers for the purposes of recommending standardization on some of the major dimensions of the valves.

The work of the new Marine Standards Division has been pushed along with the result that the division has recommended the adoption of a host of S. A. E. standards for marine practice. The list includes:

Adjustable yoke rod ends; plain yoke rod ends; eye rod ends; yoke and rod end pins; cotter pins; spark plug shells; screw standards up to 1½ in.; screw thread tolerances; tap drills; large diameter screw thread; lock washers; square broached fittings; six-spline fittings; ten-spline fittings; four-spline fittings; carbon steels; screw stock; steel castings; nickel steels; nickel chromium steels; chromium steels; chromium vanadium steels; silico-manganese steels; heat treatments; bearing metals; phosphor bronze; brass casting metals; manganese bronze sheets and rods; hard cast bronze; gear bronze; aluminum alloys; brass sheets and strips; brass rods; tobin bronze rods; non-ferrous metal tubing; round tension test-specimen; flat tension test-specimen (alternate); shock test-specimen; gray iron test-specimens; Brinell hardness test; cold drawn seamless steel tubes; bands and strips; roller bearings; carburetor flanges ½ to 2 in.; carburetor flanges 2½ to 3½; flared tube unions; gasoline pipe sizes; flared tubes, ells and tees; throttle levers; throttle lever throw; carburetor air heater; magneto dimensions; tire-pump base dimensions; electric bulb bases, sockets and plug ends; location of engine number; oversize cylinders; piston-ring grooves; storage battery directions; electrical insulation requirements; flexible steel tubing.

The Tire and Rim Division have finally submitted standards for demountable rims for military trucks. These standards appear to be highly satisfactory. The division has suggested special designs which make the layout of wedge rings and side flanges much more simple than those proposed by the Quartermaster's Department. One type of wedge ring will serve for all single and dual tires of whatever sectional size, and only one section of center wedge ring is needed for all widths of dual tires. All side rings are also reduced to one type which may be used for inner or outer flanges of single or dual tires.

## Prest-O-Lite Trade Mark Upheld

### Court of Appeals Reverses Previous Decision—Prest-O-Lite Not Generic Term

ALBANY, N. Y., May 2.—The term Prest-O-Lite is a legitimate trade mark and the Prest-O-Lite Co., Indianapolis, is entitled to protection in regard to its use, according to the decision of Judge Crane of the Circuit Court of Appeals of the State of New York.

This is the final decision in the suit brought by the Prest-O-Lite Co. against Frederick Ray, F. Arthur Haines and Daniel R. Smith, doing business as Smith & Haines, early in 1913, charging violation of the trade mark law of New York, which imposes a penalty of \$100 on any person violating the following regulation:

"Any person or corporation engaged in manufacturing, packing, bottling or selling any article of merchandise, put up by him, for sale of any bottle, vessel, box, package or other receptacle, with his name, trade mark, label, or private mark appearing in any way thereon, or branded, stamped, affixed, blown or impressed thereon may file in the office of the Secretary of State and in the office of the County Clerk."

Smith & Haines were alleged to have sold one of the Prest-O-Lite Co. containers marked with the label Prest-O-Lite and filled with acetylene gas manufactured by the Searchlight Gas Co. Suit was brought in the Municipal Court, where judgment was rendered in favor of Prest-O-Lite, this being affirmed by the Appellate term. The Appellate division of the Supreme Court, however, reversed the decision and dismissed the complaint on the ground that Prest-O-Lite had become a generic term, indicating the article of manufacture, irrespective of its makers, and therefore not the subject of a trade mark.

In reversing the decision of the Appellate division Judge Crane pointed out the exchange system established by the Prest-O-Lite Co. clearly connected the word Prest-O-Lite with the manufacture and established business methods of the Prest-O-Lite Co. The court also found the fact that the Prest-O-Lite had but a limited license from the owner of the patent, the Commercial Acetylene Co., an important factor in the situation.

### Goodyear Holds Positions Open

AKRON, May 3—The Goodyear Tire & Rubber Co., in an effort to stimulate enlistment, will hold the positions open for those enlisting until their return at the expiration of their terms of enlistment.

## Write Your Congressman

Do not let to-day pass without writing your Washington congressman protesting to him against the levying of the 5 per cent tax on automobiles at the source of manufacture. The article on page 845 tells all about it.

## Enroll 40 Truck Train Crews

### Four-Year Enlistment in Quartermaster Enlisted Reserve Corps for 1360 Drivers

NEW YORK, May 1—The Quartermaster Corps, Department of the East, through orders issued from Washington and transferred through Major Frank H. Lawton, is now in the field for crews to man forty motor truck trains for army work. The Motor Truck Club of America will do a large share of the work.

There men are to be recruited into the Quartermaster Enlisted Reserve Corps and will enlist for a 4-year period with but 15 days' compulsory service yearly, if so ordered. They will not be called to active service for the government until such time as an emergency arises. As thirty-four drivers are to be recruited for each truck train, the total number to be secured will be 1360.

This work will be carried on in Boston and this city through committees. Other committees are now in the course of formation in Philadelphia and Atlanta, Ga. The New York committee will undertake to carry on the work in the States of New York, Pennsylvania, New Jersey, Maryland, Virginia and West Virginia.

A similar committee has been formed in Boston to obtain recruits in the six New England States which will form the Northeastern Department of the present Department of the East.

The Southeastern Department will include North Carolina, South Carolina, Georgia, Florida and Alabama. Headquarters are at Atlanta.

It is not the intention of the various committees to recruit drivers solely from the ranks of present-day drivers, as that procedure would seriously cripple the present industrial transportation life in the localities from which such men were taken. It is rather the intention to obtain enlistments from among the ranks of those who own or drive their own cars and from college graduates who could be made into drivers of the highest class after a short period of training.

The truck drivers are enlisted as sergeants instead of privates. An enlistment station for the Department of the East has been located at Governors Island, but will be moved to the United States Rubber Co.'s building at 1790 Broadway, New York, where application blanks may be had. Other recruiting stations will be opened at Philadelphia, Washington, Buffalo, Rochester, Syracuse and various cities throughout the entire present Department of the East.

Applicants for enlistment as truck drivers must be between the ages of 18 and 45. They will be examined by a special examining board. They will be required to keep themselves physically fit for military service for a period of 4 years and to attend each year, if ordered to do so, an army encampment for 2

weeks only, for which duty they will be paid. Men who enlist in this reserve retain their status as civilians and are only required to leave their homes to attend an encampment in time of war or threatened war.

Truck drivers in the Enlisted Reserve Corps will receive \$36 a month, and will have their railroad fares and general expenses paid. They will be supplied with uniforms the same as enlisted men of the Quartermaster Corps of the regular army reserve, except for insignia.

### Colleges for Aviation Training

WASHINGTON, D. C., May 2—Following a conference here between the Aeronautic Division of the Council for National Defense and a number of heads of colleges throughout the country, the following institutions have been designated as training schools for army aviators: Cornell University, Illinois State, Ohio State, California State and Texas State Universities, and the Massachusetts Institute of Technology.

The War Department will order practical aviators to each of these institutions as instructors to assist three faculty members from each university who will be detailed as instructors. In the meanwhile each of these universities will send its three faculty members to study practical aviation problems at the Canadian Training School, connected with the University of Toronto.

The Ohio State University has made arrangements to use a string of ten aviation fields being established between Columbus and Dayton by a Dayton aeroplane company. The two cities will be terminals of a regular flying course.

The Signal Corps has selected ten sites for aviation training camps, the greater part of which will be opened by July 1. The location of these camps is not yet announced.

### Goodrich Officials Buy War Bonds

AKRON, May 3—More than 100 Goodrich officials have signed pledges to take war bonds and hundreds of minor employees have signed to take at least one bond each.

## Class Taxation

The 5 per cent war tax on automobiles sold from the factory as proposed by the subcommittee of the Ways and Means Committee in Washington should be opposed by every reader of THE AUTOMOBILE on the ground that it is class taxation. We all stand ready to pay our share of the \$2,000,000,000 war taxes required each year. We will cheerfully do whatever we are called upon, providing it is equitable in relation to other industries, but we are unalterably opposed to such class taxation as this 5 per cent tax is.

## Industry to War on 5% Tax

### N. A. C. C. and Accessory Manufacturers Urge Members to Wire Congressmen

NEW YORK, May 3—The entire automobile industry, including automobile, parts and accessory manufacturers, is being marshalled in opposition to the 5 per cent war tax on automobiles at the source of manufacture by the two national organizations, the National Automobile Chamber of Commerce and the Motor and Accessory Manufacturers. Both of these organizations have wired their entire membership asking them to wire Congressmen and Senators at Washington protesting against the 5 per cent tax because of its being discriminatory and class legislation, but also expressing a complete readiness to share an equal burden of war taxation with all other industries, and favoring the excess profit tax as modified to meet war needs.

Although the telegrams have been out but a short time, both the N. A. C. C. and the M. A. M. are already flooded with replies from members in which all of them are unanimous in favoring the excess profit tax, but strenuously opposing the 5 per cent tax on automobiles at the source of manufacture.

The complete telegram sent out by both organizations is:

"War creating critical situation, workmen being laid off, production being curtailed. Official Washington says that Federal tax on automobiles in use is unconstitutional and therefore a special war tax of 5 per cent on the factory sale price of cars is proposed by the subcommittee of the Ways and Means Committee which has the drafting of such a measure in hand. It is impossible to charge this extra tax to consumers in view of increased prices now paid. In co-operation with (N.A.C.C.) (M.A.M.) please wire and have others wire Congressman \_\_\_\_\_, Washington, expressing readiness to share full and fair taxation, but protesting against discrimination aimed at automobile industry. Washington officials are judging the automobile industry by the great prosperity of a few rather than the average of the many, despite the fact that hundreds of firms have failed in the past 5 years. Such unconstitutional tax, with other burdens of increasing cost, and declining markets would seriously affect allied industries. We endorse excess profit tax on all industries."

Over half of the membership of the N. A. C. C. have responded favorably and it now seems certain that there will be a recast of the taxation scheme by the subcommittee of the Ways and Means Committee because of the strong and very general opposition by the automobile, accessory and parts industries.

### Sweet Back from Europe

GRAND RAPIDS, MICH., May 3—George Sweet, vice-president of the United Motors Co., returned yesterday from Europe.

# Factory Activities

OAKLAND, CAL., April 30—The Fageol Motors Co. will establish a motor truck factory in Oakland and the company will produce a new type of truck. The first allotment will be for 150 trucks, ranging in size from 2 to 5 tons, and it is expected that deliveries will begin July 1. The first unit of the factory will be 50 by 250, concrete and steel. The Fageol company became prominent several months ago through the announcement of the highest-priced passenger car chassis—a design fitted with a Hall-Scott aviation motor. Later the company withdrew from the passenger car field temporarily to permit government use of the entire Hall-Scott production.

MILWAUKEE, WIS., April 28—Ground was broken to-day by the Wisconsin Motor Mfg. Co. for a huge machine and assembling shop addition, 115 by 275 ft. The concern recently increased its capital stock from \$350,000 to \$1,000,000 to provide for the extensions and the growth of the business. The new facilities will be available about July 1, it is expected.

WINDSOR, ONT., April 27—The Ford Motor Co. of Canada, London, Ont., will build a plant costing \$150,000. It plans to install a complete plant for enameling automobile bodies, including large ovens.

DETROIT, April 28—The Chalmers Motor Co. has purchased 6 acres of factory land from the City of Windsor, Ont., and will begin the erection of a two-story factory next week. This building will replace the one recently destroyed by fire.

DETROIT, April 28—The City of Windsor, Ont., is negotiating with the Saxon Motor Car Corp. for the sale of a factory site in Windsor.

MOUNT BRYDGES, ONT., April 26—The Crow Motor Co. will erect a plant at London, Ont., to cost \$100,000.

PHILADELPHIA, April 27—The plant of the S. S. E. Co. is completed and will soon be in readiness to make \$5,000 chassis. Victor Lee Emerson, president of the company, states that although nothing will be turned out for several months, the plant is sold ahead for 1 year.

PLAINFIELD, N. J., April 28—The American Motors Corp. has removed its advertising department to the Springfield factory.

YOUNGSTOWN, OHIO, April 27—The Republic Rubber Co. is contemplating building additions to its plant. Engineers have been engaged on plans for the additional buildings for some time. Some of the buildings will probably be

erected on the 40-acre tract which the company owns on the east side of Albert Street extension. It is proposed to at least triple the present capacity of 3000 tires a day. Extensions will also be made to increase the output of mechanical rubber goods.

The company also plans to contribute its share toward solving the housing problem in this city, and will erect a number of modern dwellings on Republic Avenue, near the plant.

POTTSTOWN, PA., April 27—The North American Motors Co. will soon start on the construction of its new plant. The building will be 302 by 72 ft., and will be located at Queen and Bailey Streets.

DETROIT, May 2—Packard has placed an order for 3000 truck radiators to be delivered by June 30. The company usually buys 200 radiators per month.

WATERTOWN, WIS., April 28—The Morgan Screw Corp., Newport, R. I., is negotiating with a committee of business men and capitalists of Watertown, with a view of relocating its plant and headquarters in that city. The company asks local capital to take a \$50,000 interest by stock subscription. It agrees to dispose of its present plant in Newport and move the equipment, valued at \$69,000, to Watertown, where a new plant employing 100 will be established if a suitable building is provided at a reasonable rental with option to purchase. It is stated that the company has from \$85,000 to \$100,000 worth of unfilled contracts, mainly from automobile manufacturers.

MILWAUKEE, WIS., April 28—The Evinrude Motor Co., Milwaukee, Wis., rowboat engines, and one of the largest producers of these engines, has purchased a 10-acre tract of land as a site for its new plant, to cost about \$250,000 complete. The Evinrude company will engage in the manufacture of engines for farm and general utility purposes, these being designed to use kerosene and the heavier distillates of petroleum as fuel, but will continue to make rowboat engines. The present plant at 279-281 Walker Street, Milwaukee, will be abandoned upon the completion of the new

works. Contracts will be awarded about May 28 for the erection of the new group, the main buildings of which will be a machine shop, 300 by 300 ft., and a gray iron foundry, 80 by 200 ft., with a 60-in. cupola. A brass foundry unit also will be provided.

PHILADELPHIA, April 27—The Atwater-Kent Mfg. Co. has awarded a contract for the erection of a two-story building at Logan and Stenton Avenue. The building will measure 14 by 217 ft. and will cost \$75,000.

GREENVILLE, MICH., April 28—The Tower Motor Truck Co., recently organized by local capitalists, has just started operations in its new plant here, and expects to be turning out 100 machines this year. The building is fireproof, 60 by 220 ft.

LOGANSPOUT, IND., May 1—Work was started yesterday on the construction of the buildings for the Revere Motor Car Co., which will assemble the Revere car, using a Duesenberg engine. The buildings will have a floor space of 33,000 sq. ft., and the plant will have a capacity of 2500 cars yearly. The buildings will be finished in 60 days.

St. JAMES, MO., April 30—The Universal Motor Truck and Traction Engine Co. will probably select a site in this city on which to build a \$60,000 plant. The first truck model will be on exhibition by June 1. The factory will be completed by Jan. 1. The company was organized last November.

FLINT, MICH., April 30—The Chevrolet Motor Co. has established a community eating house at its plant, where meals are furnished at cost to employees.

OWOSSO, MICH., April 27—The Field Mfg. Co., which recently moved here from Ionia, will begin shipping truck bodies some time this week. The company manufactures a ½-ton truck body in the plant of Republic Motor Truck Co., Alma, Mich.

MILWAUKEE, WIS., April 28—The Davis Mfg. Co., a large manufacturer of gasoline engines for a variety of pur-

## The 5 Per Cent Tax

• Write your Washington congressman to-day protesting against the assessing of the 5 per cent war tax on automobiles at the source of manufacture. Do this on the ground that it is class legislation and if passed there is a probability it would be declared unconstitutional. Don't forget that the automobile industry stands ready and willing to carry its equitable share of the \$2,000,000,000 war taxes that must be raised each year. The industry is, however, opposed to class legislation. It will pay its share in any increase in the excess profits taxed. It will pay its share in gasoline taxes, but opposes class taxation.

poses, is completing work on a machine-shop addition which will double its facilities, and on May 1 will break ground for a foundry addition, 100 by 300 ft., which will increase the casting capacity by 100 per cent.

TOLEDO, May 1—The Mather Spring Co. has granted its employees an eight-hour working day at ten-hour pay.

HARVEY, ILL., April 30—The Maxfer Truck and Tractor Co. has purchased a new plant here, one of the suburbs of Chicago, for the manufacture of its trucks. The new plant is ten times as large as the old plant, and production after the first of May will be 300 Maxfers per day.

DETROIT, April 30—The Packard Motor Car Co. has indefinitely postponed the building of its concert hall and service station, which, as reported in a recent issue of THE AUTOMOBILE, it planned to erect.

There is a possibility that the Packard company's resources may be commandeered in whole or in part and under the circumstances created by the war, the board of directors has considered it best to refrain from any outside enterprise at this time.

CHICAGO, ILL., May 2—A strike of employees of the Stewart-Warner Speedometer Corp. over placing a woman in the

position of a man who resigned has been settled. It lasted but a few days.

Enger Plant Sale on May 24-25

CINCINNATI, May 2—The plant of the Enger Motor Car Co. will be sold at public auction May 24 and 25 by Winternitz & Co., Chicago, for the receiver, L. J. Dauner.

Alter Factory For Sale

PLYMOUTH, MICH., April 30—The plant of the Alter Motor Car Co. is offered to the public for sale. It contains 22,000 ft. of floor space, and is equipped for the assembling of automobiles.

# Production

CLEVELAND, April 26—The Chandler Motor Car Co. is shipping cars at the rate of over 28,000 cars a year. During the week of April 14 the company made a record shipment of 618 cars. In the first 2 weeks of April a total of 1173 cars were shipped, which indicates over 2400 for the month, 82 per cent ahead of a year ago. Last year total shipments were 13,073 cars. The shipments, by months, compare as follows:

	1917	1916
January .....	715	480
February .....	1348	926
March .....	2319	1008
April (2 weeks).....	1173	667
Total.....	5555	3081

DETROIT, April 28—On Thursday, April 26, the Ford Motor Co. produced 3100 cars, the biggest day in its history. It is stated that April will be the biggest production month the company has experienced.

JACKSON, MICH., April 27—The Briscoe Motor Car Corp. is increasing its manufacturing schedule for the spring and summer by 5000 cars, and will also turn out 2000 Redden truck-makers monthly for the next 4 months. The Briscoe corporation has received telegram orders this past week for more than 5000 cars.

CLEVELAND, April 27—On the first 1000 cars delivered by the Jordan Motor Car Co. the total replacements from the factory amounted to \$387.50. This in-

cluded no replacements of parts of minor equipment. The company has shipped to date \$1,700,000 worth of cars, and the production for the coming year will be increased.

ST. LOUIS, Mo., April 27—The Maxwell Motor Car Co. assembling plant here is now turning out twelve complete Maxwells daily.

DETROIT, May 2—The Harroun Motors Corp. has started production and is now building motors.

CANTON, OHIO, April 27—The BeSaw Tire & Rubber Co. is planning an increase in its tire output from 150 to 500 tires a day. The capital is to be increased from \$220,000 to \$1,000,000. New buildings are being planned and work will be started on them in the near future. About 200 additional men will be needed in the plant.

KENOSHA, WIS., April 27—The first trainload of trucks has left the Nash Motors Co. plant, comprising twelve Jeffery Quads and twenty-eight Jeffery All-Purpose trucks, to the H. Barcroft White Corp., Nash distributors in Syracuse, N. Y. This is a new record for individual shipments of Jeffery trucks.

CLINTONVILLE, Wis., April 28—The Four Wheel Tractor Co., which as reported in earlier issues has been organized in Clintonville, to manufacture

tractors and trucks in which power is applied to the four wheels, is beginning production, and expects to have twenty tractors out during May. The concern is capitalized with \$125,000, and all the stock is taken up except \$15,000 worth. The tractor is a light machine, designed to haul four plows.

BAY CITY, MICH., April 27—The Tu-Ford Valve Tool Co. has commenced manufacturing its latest Tu-Ford valve tool for Fords. This raises the spring, and second, it automatically locks when the spring is raised, making it easy to remove the valve and still insure the tool holding the spring in raised position. The tool also holds the spring in place when removing the valve for grinding.

MANSFIELD, OHIO, April 27—The Mansfield Tire & Rubber Co. has reached the mark set a week ago in making 1000 tires and 1000 inner tubes in 24 hrs.

JACKSON, MICH., May 2—The Hayes Wheel Co., is enlarging its plant to increase its output to 18,000 hubs per day.

PAINESVILLE, OHIO, May 2—The Collier Truck Co. has secured a \$12,000,000 contract from a Cleveland corporation calling for the delivery of \$2,000,000 worth of trucks this year. The company guarantees to deliver 500 trucks per month. New factories are to be erected and additional men employed. A Cleveland concern has furnished performance bonds to protect the Collier company.

DETROIT, May 2—The Reo Motor Car Co. shipped a train load of fifty-one flat cars, each carrying three pleasure or truck vehicles, to Los Angeles dealer yesterday. The second shipment will be made in 4 weeks on the same set of flat cars. The Los Angeles dealer finds that train loads come through in 9 to 14 days, while less than train loads take 4 to 6 weeks. He unloads promptly, and has arranged with the railroads so that the train load of empty flat cars is immediately returned to the factory for another shipment.

## Automobile Industry Taxed

The automobile industry stands willing to pay its just and equitable share of the \$2,000,000,000 war tax which must be raised each year. The automobile manufacturers expect to pay a due proportion of this in the form of increased excess-profit taxes. They expect to pay in other ways, but are opposed to a 5 per cent tax on the selling price of all automobiles when sold from the factory to dealers and others. This is class legislation. As such it is unfair legislation. It should be opposed by every automobile manufacturer and every person connected with the industry. Do your part in opposition to this tax. Write your congressman at Washington protesting against it on the ground of its being class legislation. We are all willing to share our burden of war taxation, but we object to class taxation.

# Personals

DETROIT, May 1—George W. Dunham, president of the Society of Automotive Engineers, has returned from Washington. Mr. Dunham is a member of the board for motorizing field artillery and he, in conjunction with the counselors of the Society of Automotive Engineers has established an office in Washington so that the society will be in close touch with the government.

WASHINGTON, D. C., April 27—F. A. Seiberling, president of the Goodyear Tire & Rubber Co., and a director of the Chamber of Commerce of the United States, has been appointed chairman of a new wartime committee of the National Chamber. Mr. Seiberling's committee is expected to investigate and recommend a plan for taking care of the dependent families of soldiers engaged in the present war.

DETROIT, April 30—Frank Briscoe, who recently resigned from the Briscoe Motor Corp., has offered his services to Washington through the Society of Automotive Engineers and has been called East for a conference.

DETROIT, May 2—Frederick C. Blanchard has been elected vice-president in charge of manufacturing of the Detroit Lubricator Co. Mr. Blanchard was formerly works manager of the Ashcroft Mfg. Co.

DETROIT, April 30—Hugh Chalmers, president of Chalmers Motor Co., will be one of the speakers at the convention of the Associated Advertising Clubs of the world, which meets in St. Louis, Mo., June 3 to 7.

DETROIT, April 28—G. U. Radoye, whose resignation from the Hudson Motor Car Co. was recently announced in THE AUTOMOBILE, has been appointed assistant to Frank C. Kipp, manager of the carriage sales department of the Packard Motor Car Co.

WINNIPEG, MAN., April 27—J. R. Archibald has been promoted to district sales manager of the Maxwell Motor Car Co. in Winnipeg and will be the manager of the Alberta and Saskatchewan districts.

DETROIT, April 27—J. R. Collins has resigned from the Maxwell Motor Car Co. to become vice-president and treasurer of a large eastern concern. He was assistant general auditor.

PITTSBURGH, April 28—H. R. Keeling will become advertising manager of the Haynes Automobile Co., Kokomo, May 7. He has been connected with the merchandising department of the Armstrong

Cork Co., Pittsburgh. Prior to this connection, he was for 3 years a member of the staff of the Indianapolis *Star* and later was advertising manager of a large Indianapolis automobile distributing agency.

DETROIT, April 30—Albert E. Schaefer, general manager of the Scripps-Booth Corp. was struck by an automobile truck last week and is suffering from a broken leg.

DETROIT, April 30—James E. Morgan, secretary and treasurer of the Wallace C. Hood service bureau, has been assigned to the first division of the United States Navy, and is in service on the battleship Iowa. H. G. Moesta, special representative of the bureau, has been transferred for service on United States steamship Columbia, which entered active service April 21 as flagship for the Atlantic submarine flotilla. D. H. Geddis, sales manager of the Scripps-Booth Motor Car Corp. and Herbert J. Woodall, assistant branch manager of the Ford company of Chicago, are also on the Columbia.

DETROIT, April 30—Eddie Pullen, the well-known racing driver, has been appointed technical expert of the Pacific Coast Chevrolet factory. He will travel the entire territory supplied by that plant and supervise the service of Chevrolet dealers.

CLEVELAND, April 30—Herbert J. Douglas has joined the Standard Parts Co. and will have an important place in its accounting department. Mr. Douglas has been with the Sherwin-Williams Co. for 14 years, latterly as comptroller.

BATTLE CREEK, April 30—A. H. Sollins, formerly with the Locomobile Co., is promoting an automobile factory here. A mass meeting was held recently and \$26,850 of a necessary \$50,000 was pledged.

INDIANAPOLIS, April 30—Frederick S. Lawrie, has resigned as sales manager of the Spacke Machine & Tool Co., to give his attention to a selling agency which he is operating under his own name, with offices at 910 Merchants Bank Bldg. Mr. Lawrie represents a number of important concerns, including: Western Auto Machine Screw Co., Elyria, Ohio, standard and special screw machine products; Transue & Williams Steel Forging Co., Alliance, Ohio, heavy steel stampings; Metal Specialty Co., Cincinnati, light steel stampings; and Spacke Machine & Tool Co., special automobile machine parts.

DETROIT, April 28—Ludwig Arnson and J. E. Simonds, have respectively been appointed in charge of offices established by

the Duplex Engine Governor Co., in Detroit and Chicago. The Detroit office, just opened is at 901 Kresge Bldg., and the other at 2118 Mallery Bldg.

DETROIT, April 30—Frank E. Sangbush has been appointed office sales manager of the Columbia Motors Co. Mr. Sangbush has been connected with the Abbott-Detroit Motor Car Co.

DETROIT, April 27—Harry A. Fitzjohn has been appointed director of purchases for the Hayes-Ionia company of Grand Rapids. Mr. Fitzjohn was formerly purchasing agent for the Springfield Body Corp. and resigned to assume his new duties.

FLINT, MICH., May 1—Victor Launeau has become chief automobile designing engineer of the Pan Motor Co., St. Cloud, Minn. The Pan Motor Co. is a new company organized under the laws of Delaware for \$5,000,000 to manufacture automobiles, trucks and farm tractors. Mr. Launeau was formerly research engineer of the Buick Motor Co.

TOLEDO, May 2—J. H. Hundt has become supervisor of sales of the Champion Spark Plug Co. He was formerly vice-president and sales manager of the Atlas Auto Supply Co., Chicago.

Chester Bevans, prominent in the Denver automobile trade, will cover Colorado, Utah, Wyoming and New Mexico for the Champion Spark Plug Co.

## ELECTIONS

BUFFALO, N. Y., April 27—The following officers were elected at the annual meeting of the board of directors of the Pierce-Arrow Motor Car Co.: President, Colonel Charles Clifton; vice-president, Henry May; second vice-president, W. J. Foss; secretary, L. H. Gardner, and treasurer, W. C. Wrye. This list of officials maintains the present personnel except for the election of W. J. Foss as second vice-president.

Mr. Foss was appointed commercial manager of the company in October, 1915. A few months later he was elected to the board of directors. He will continue to have full charge of all the company's selling activities.

NEW YORK, April 30—E. S. Maddock has been elected first vice-president of the Guarantee Securities Corp., being advanced from the second vice-presidency. Paul Fitzpatrick has been made second vice-president, and J. Alexander, who has been secretary, has been elected treasurer and will serve in both offices. John B. Swinney has been added to the list of officers as assistant secretary. The company recently declared a dividend of 2 per cent.

## Metal Prices Feature Market

### Government Requirements Big —Wage Increases Cause Rise in Coal Field

NEW YORK, May 2—The exact effect of war on the metal markets not only of the United States but of the world is a little more definite than a week ago. Last week prominent men of the steel industry declared that government requirements will absorb between 2 per cent and 3 per cent of the mill capacity. This will amount to 900,000 to 1,300,000 tons. The steel men also agreed to appoint a committee for the purpose of distributing among steel manufacturers the various requirements of the government.

It is the general consensus of men in the steel industry that hoarding is still continuing by many manufacturers in varied lines of industries, notwithstanding assurances from metal experts that the steel demands of the U. S. Government and the Allies would not necessarily bring about a scarcity of steel. Further assurance is given that at the maximum the steel industry of this country is able to take care of all war demands without hardship to itself or to the consuming public. The question of supply is wholly aside from that of price. The cost of steel production is gradually increasing, an advance of from 10 to 15 per cent in wages having been started in many plants on May 1.

#### Pig Iron Advanced

Pig iron prices have advanced during the past week. Orders indicating various demands on the steel market are being recorded. France has been placing contracts for steel rails for 700 miles of tramways and trenches. Washington has contracted for 1000 tons of sheet to be used in the manufacture of camp equipage and powder tanks.

In the coal market the increase on May 1 of practically 20 per cent to anthracite workers may result in an increase in the price of coal ranging from 50 to 75 cents per ton. There is no shortage of coal at the mines but a very general shortage of surplus coal throughout the country due to lack of railroad shipping facilities. The consumption of anthracite coal is heavier because of the greater use of it by railroads. The late spring has increased the consumption.

Assurances that Argentina is not going to place an embargo on hides from that country is a welcome report. Our tanneries have been receiving great quantities of hides from that source and now that the supply from certain European countries has discontinued, it is correspondingly imperative to continue our supplies from other countries.

The recent orders from Washington directing the country's railroads to give coal and iron ore preference over all other traffic may relieve the present situation. This order will have a potent

effect on shipments of other materials, etc., to the factories.

In lieu of arbitrary price fixing by the U. S. Government, it is expected that efforts will be made in the direction of a curtailment of steel consumption in fields not directly connected with the war. In this way supplies will be conserved and price reductions follow, as a matter of course. In the opinion of the steel trade, the prices are attributable to the buying of far in excess of needs. Consumers have rushed into the market in a panic in an effort to provide against future needs without regard to the effect of their action on prices. Experts state that Government demands will not bring about a scarcity of steel. At the maximum, the steel industry of this country is able to take care of all war demands without hardship to itself or to the consuming public.

The rise of \$5 a ton on Bessemer and open-hearth steel featured the activities of the metals markets last week. Both are now quoting at \$80, the highest in the history of the steel market.

Oils were higher, linseed quoting at \$1.22 a gal., a 2 cent rise, and rapeseed oil at \$1.35 a gal., a 5 cent rise. Kansas and Pennsylvania crude petroleum, however, remained unchanged. A rise in either of these two, it is stated, is bound to force up gasoline prices. Gasoline prices are gradually being readjusted throughout the country, rise having already taken place in St. Louis, Chicago and Minneapolis.

#### Gasoline Prices Higher

Apropos of the gasoline situation, prices are expected to rise considerably due to American and Mexican conditions. The American conditions have already been explained as due to the tremendous demand from the automobile market. Mexico, on the other hand, has recently decreed that a heavier export tax on oil and its derivatives be placed, thus hurting the heavy shipments of oil to Great Britain. As a result, it is expected that Great Britain will place much of its oil orders in the United States, thus further depleting our supply and forcing up prices on the derivatives. Mexico, however, is expected to increase its shipments this year, due to the launching of many additional oil carriers.

#### Cotton Acreage Decreased

According to estimates, the cotton acreage at the present time shows a decrease of 2.5 per cent as compared with a year ago. The propaganda for more grain and food crops is the chief cause. Makers of tire duck, etc., are expecting a large increase in prices. Tire prices as a consequence are slated for further increases. The cotton season is now 10 days late, the ground is poorly prepared in the eastern states, but unusually well in the West. Very little cotton is planted. As a result, there will be little demand for steel and other metals from this field.

Railroad managers are confronted with congestion on the Eastern lines, which results in a shortage of cars, although some improvement is being shown from week to week, and until

## Tire Prices Again Rise

### Hardman and Delion Quotations Up 10 to 15%—Tubes Up 5%—Rubber Higher

NEW YORK, May 1—The Hardman Tire & Rubber Co. and the Delion Tire and Rubber Co. have taken the first step in the long expected tire-price increase. They have raised their prices from 10 to 15 per cent. Tubes are up about 5 per cent. It is expected that the other companies will follow suit because of the present conditions. Rubber and tire fabrics are advancing again. Yesterday the upward movement in plantation rubber which started late last week received fresh impetus on receipt of cables reporting a further advance of at least a ½ penny in the London market. Added to this is the threatened Government duty of 20 per cent on all rubber imports. The tire fabric mills are all sold up to the end of the year and some contracts with consumers cover part of next year's requirements. The scarcity of Sea Island and Egyptian staples has created an active demand for Peeler fabrics. Standard 17¼-ounce Sea Island and Egyptian fabrics are now about 5 cents a square yard higher.

The following prices will give a comparison of the old and new prices on Hardman and Delion tires:

Delion		Old Price	New Price
Size			
28 x 3, plain	.....	\$16.50	\$18.50
34 x 4, plain	.....	35.30	38.83
36 x 4, plain	.....	37.30	41.03
Hardman			
30 x 3, plain	.....	\$15.00	\$18.00
34 x 4, plain	.....	31.90	37.00
36 x 4, plain	.....	34.00	40.00

#### Low Spelter Prices Force Zinc Downward

JOPLIN, Mo., April 27—Zinc ore dropped another \$5 per ton this week making the top basis price for choice

(Continued on page 854)

the commerce commission has effected such legislation as to allow the roads to increase freight rates upon the basis in which petitions have been made, there is little probability of any buying of equipment being resorted to until some additional revenue is in sight.

It is stated that the Government in its next purchases of copper will pay substantially the market price, instead of demanding the recent low prices.

Rubber prices this week hinge on the war taxes. The cost of rubber manufacturing will be increased considerably if Congress adopts suggestions for imposing a tax on various crude materials now admitted free of import duty. A tax of 20 per cent has been suggested on crude rubber. This would jump the present price of approximately \$1,500 a ton to \$1,800. Another tax suggested provides for 2 cents a pound on unmanufactured cotton. At present the bulk of the long staple cotton used in tire manufacture is imported from Egypt.

ores in carload lots \$75 per ton. The range was down to \$65 which gives the average basis for the week \$75 per ton. This drop in price brings the price of ore to a figure where numerous sheet-ground mines may be unable to continue operation. Many of the best producing properties can not produce concentrates below \$70 with the present prices of supplies, powder and labor. Most supplies have increased in price during the past week.

The slump in prices has been brought about by the lower prices for spelter and evidence that the smelters themselves are making only a small margin of profit is shown by the fact that two large smelters of the American Lead, Zinc and Smelting Co. will close down in the near future, one at Deering and one at Neodesha for a total of more than 8000 retorts. A smelter at Sand Springs, Oklahoma with 8000 retorts is operating only a single block of about 600 retorts. Many other smelters are working far below capacity.

Lead ore remained firm all week with \$110 paid for 80 per cent ores. Weather conditions have been excellent, heavy rains helping the dry mines more than they hurt the wet ones.

**GASOLINE PRICE INCREASES**

MINNEAPOLIS, MINN., April 26—Gasoline prices here have been advanced 1 cent a gallon, making various grades 21 to 25 cents.

ST. LOUIS, Mo., April 26—Gasoline has been advanced 1 cent a gallon to 19.4 cents. Naptha was also advanced 1 cent to 18.9 cents a gallon.

**25 Rainier Trucks for Government**

NEW YORK, April 27—The Rainier Motor Corp. has sold a fleet of twenty-five trucks to the United States Government. These trucks are to be used by the Navy Department. All of the trucks are of the ½-ton capacity with express bodies.

**Federal Trucks for Red Cross**

DETROIT, April 27—The Federal Motor Truck Co. has received orders for four 3½-ton trucks for the American Red Cross and four 3½-ton trucks for Red Cross service in Belgium.

**Embargoes Cut Steel Output**

**Mills Choked with Finished Products Awaiting Distribution—Russian Contracts**

DETROIT, April 30—Fresh railroad embargoes on freight shipments from Pittsburgh have choked the mills with finished products awaiting distribution, and it may become compulsory to cut down the output.

**Concern Over Russian Contracts**

The prospect of having to provide 500,000 tons of steel for construction of Russian cars and locomotives in this country in addition to meeting domestic and foreign contracts is causing concern in the steel trade. The government's present requirements which comprise 1,200,000 tons can be handled, according to the steel makers, but they state that the orders for Russia will overtax their resources.

Details apportioning the government's tonnage among the mills were arranged by a committee of steel companies last week. Probably more than 50 per cent of the steel needed will be provided by the United States Steel Corp. subsidiaries.

Orders for cars this month have been less than 6000, and orders for 60,000 tons of steel for car construction have been placed.

Locomotive builders have accepted contracts for 300 engines this month of which 170 are for foreign roads. About 50,000 tons of steel have been ordered with which to construct these engines.

Railroad buying of rails totaled 250,000 tons this week, all of which was under contract calling for delivery late in 1918 and early in 1919 so that no disturbance of present mill schedules will result.

**Prices Generally Higher**

There has been considerable activity in track supplies, which are now 20 per cent higher. Light rails are now \$5 a ton higher. Other steel products are rising in price; bars are up \$3; shapes \$5 to \$8, and plates \$10 a ton on minimum quotation mill shipment and \$5 to \$10 a ton on warehouse shipment. New structural work is light. Great activity in the interior resulted in the sales of 130,000

tons of pig iron during the past week.

If increase in steel continues, all cars will be forced to increase prices at the rate of \$90 per thousand by Sept. 1.

**Oldfield Motors To Build Aero Engines in Duluth**

DULUTH, MINN., April 27—A new industry to manufacture aeroplane engines and employ 100 men in the outset will be established here and will be known as the Oldfield Motors Corp., and will also complete during this season a contract for 5000 6 hp. engines for gas tractors. The airplane engine which will be made by this company will be 125 hp. and will weigh 225 lb. It has met with the approval of the aviation section of the United States War Department, and it is expected that a large contract will be placed with the company by the Government. The company has taken over the old plant here, comprising several buildings, and the main building is 140 by 160 ft. The president of the company is Lee W. Oldfield, and associated with him are John B. Cooper, John P. Ernster, Harry M. Giles and Alfred Kreig.

**Ford Tractor for England**

DETROIT, May 1—It is reported that Henry Ford was visiting Halifax, N. S., to which point he accompanied Charles E. Sorenson who has sailed for England with samples of the Ford tractor, tools, jigs, dies and all of the necessary plans to enable English makers to promptly start manufacture of the Ford tractor.

**290 Tractors in Washington**

SPOKANE, WASH., April 30—There are 290 tractors in use in the State of Washington, out of the total of 34,371 in the United States, according to figures given out by the United States Dept. of Agriculture.

**220,000 Illinois Licenses to Date**

CHICAGO, April 27—To date 220,000 automobile licenses have been issued in Illinois. The total number of licenses issued during 1916 was 248,429. Owing to the volume of work imposed on the department, drivers displaying 1916 licenses will not be molested until May 16, this being the final limit for displaying a 1917 plate.

**9378 Registrations in Maine**

BANGOR, ME., April 28—Up to April 16, automobile and truck registrations in this State are far ahead of last year's record to that date. Automobile registrations total 9378 and trucks 1408, compared with 7487 and 860 last year up to that date. Dealers have been increased from 203 to 246.

DETROIT, May 2—Clifford V. Herbert, who has been working at the De Palma Mfg. Co. perfecting his tractor, is shipping the machine to Suffern, N. Y., for demonstration before representatives of European countries.

**Daily Market Reports for the Past Week**

Material	Tues.	Wed.	Thurs.	Fri.	Sat.	Mon.	Week's Changes
Aluminum, lb.	.60	.60	.60	.60	.60	.59	— 0.1
Antimony, lb.	.34	.34	.34	.34	.34	.34	...
Bessemer Steel, ton.	75.00	75.00	75.00	75.00	80.00	80.00	+5.00
Copper, Elec., lb.	.30	.30	.30	.30	.30	.30	...
Copper, Lake, lb.	.29	.29	.29	.29	.29	.30	+ .01
Cottonseed Oil, bbl.	15.35	15.50	15.70	15.85	16.00	16.03	+ .68
Fish Oil, Menbaden, Brown, gal.	.78	.78	.78	.78	.78	.80	+ .02
Gasoline, Auto, gal.	.24	.24	.24	.24	.24	.24	...
Lead Oil, prime, gal.	1.80	1.80	1.80	1.85	1.85	1.85	+ .05
Lead, 100 lb.	9.13	9.13	9.13	9.13	9.13	9.50	+ .37
Linseed Oil, gal.	1.20	1.20	1.20	1.20	1.22	1.22	+ .02
Open-Hearth Steel, ton.	75.00	75.00	75.00	75.00	80.00	80.00	+5.00
Petroleum, bl., Kans., crude.	1.70	1.70	1.70	1.70	1.70	1.70	...
Petroleum, bbl., Pa., crude.	3.10	3.10	3.10	3.10	3.10	3.10	...
Rapeseed Oil, refined, gal.	1.30	1.30	1.30	1.30	1.30	1.35	+ .05
Rubber, Fine Up-River, Para, lb.	.75	.75	.75	.75	.75	.75½	+ .00½
Rubber, Ceylon, First Latex Crepe, lb.	.81	.81	.81	.81	.82½	.83	+ .02
Sulphuric Acid, 60 Baume, gal.	1.50	1.50	1.50	1.50	1.50	1.50	...
Tin, 100 lb.	58.50	58.50	58.50	59.00	59.00	58.75	+ .25
Tire Scrap, lb.	.06½	.06½	.06½	.06½	.06½	.06½	...

## Sleeve-Valve Engine Co. Formed

American Co. of Philadelphia  
Headed by Remington Arms  
Company Interests

PHILADELPHIA, May 1—The American Sleeve-Valve Motor Co., with executive offices in the Widener Bldg., has secured ownership of the patents covering a revolving sleeve as applied to internal combustion engines. The sleeve, which revolves between the cylinder wall and piston, is propelled by a large positive worm gear at the base of the cylinder. All moving parts, except the revolving sleeve, are of conventional type.

Manufacturing plans are now in progress and deliveries are expected to start by fall. The management includes men well known in the manufacturing field. E. Remington, of the arms and typewriter company bearing his name, is chairman of the board. P. E. Remington, of the same company, is president, and has dropped all other interests to prosecute the work of this company. Wilfrid Hartley, former treasurer and factory manager of the Remington Arms Co., is vice-president.

Among the other officers and directors are also a number of prominent men in the automobile field, including E. R. Hollander, former president of the American Fiat Sales Co.; T. M. Fenner, of the Wisconsin Motor Mfg. Co.; C. P. Hollister, chief engineer, formerly with the Stanley Electric Co.; H. S. Evans, vice-president, sales manager of the International Time Recording Co.; LeRoy Ferry, of Ferry & Giol, export merchants, of Barcelona, Milan, Paris and Philadelphia; H. R. Davis, president of the First National Bank of Freeport, L. I., N. Y., and J. E. Fite and Alexander Lawrence, Jr., manufacturers in this city.

### NEW COMPANIES

CLEVELAND, May 2—The Supreme Motors Corp. has incorporated for \$1,000,000, half preferred and half common. C. F. Jamison, president, was formerly sales manager of the Saxon Motor Car Co.; B. S. Cline, vice-president; Chas. F. Davies, secretary; A. Lavery, treasurer; Courtney Mitchell, chief engineer; C. F. Manning, formerly experimental engineer of the Continental Motors Co., experimental engineer.

The company will make three styles of aeroplane motors with L-head and aluminum pistons, four-cycle and six-cycle types, each 3¼ by 5. The twelve-cycle type will be 2¾ by 5. Production will be started October 1, when 7500 motors will be manufactured during the first year and 20,000 the second year.

DETROIT, April 30—The Consolidated Truck & Tractor Co. has been incorporated in Michigan by Z. C. Barber and Forest M. Keeton to manufacture and sell a truck attachment designed by Mr. Keeton. Mr. Keeton was formerly a mem-

ber of the Keeton Motor Car Co. It is stated that manufacturing arrangements have been completed with a large plant in this State for producing these truck units and that many contracts have already been placed. The capital is \$1,500,000, divided into \$500,000 preferred and \$1,000,000 common.

ADRIAN, MICH., April 30—The F. D. Truck and Auto Co. has been formed as a successor of the Forduplex Co. It is said the Duplex Motor Co., Lansing, objected to the use of the latter name, although the Ford Motor Co. gave its consent.

CHICAGO, April 27—The Oak Mfg. Co., has been organized in Chicago to manufacture a six-cylinder passenger car, with a hydraulic transmission, and a rotary-sleeve engine of the Argyll type. The offices are located at present at 108 South La Salle Street. According to S. O. D'Orlow, designer, the new car will sell at about \$1,560.

WORCESTER, MASS., April 27—The Thibert Mfg. Co. has been incorporated with a capital of \$50,000 to manufacture automobiles. N. R. Thibert is president and treasurer.

FOSTORIA, OHIO, April 27—The Fostoria Pressed Steel Co. has been incorporated for \$100,000 by W. C. Allen, C. D. Pifer and Henry Rothcock. The company will supply all steel work for Allen cars and for steel needed in the Dale Body Co., which manufactures bodies for the Allen.

SAN FRANCISCO, CAL., April 27—The Bulls Eye Tread Tire Co. is to reorganize with a capital of \$3,000,000 and become a subsidiary of the Pacific States Tire & Rubber Co. A factory for making a new patented tire will be built and equipped at Sunnyvale.

SAGINAW, April 30—The Saginaw Auto Body has been incorporated with a capital of \$100,000 to manufacture automobile bodies. The company has purchased a plant in this city and will start production in the near future.

LOS ANGELES, CAL., April 27—The Peerless Wheel Co. has been incorporated to manufacture automobile wheels. The capital is \$15,000. The incorporators are: F. E. Powers, G. E. Somarindyk and R. A. Armstrong, all of this city.

OWENSBORO, KY., April 26—The Franks Tractor-Cultivator Co. is being organized by W. L. Franks, who will be president and general manager, W. O. Hoskins, W. L. Morton, James Jones and others, and will be capitalized at \$50,000 to manufacture a tractor-cultivator.

LYNCHBURG, VA., April 26—The Double Action Tire Pump Co. has been formed with a capital of \$50,000. A. T. Henderson is secretary.

## \$18,750,000 Net for G. M.

Sales Total \$120,250,000 for  
112,178 Cars and Trucks for  
8 Months

NEW YORK, May 2—Net profits of \$18,750,000 are reported by the General Motors Corp. for the 8 months' period ending March. Gross sales totaled \$120,250,000. Compared with the same period a year ago profits increased 7 per cent and sales 17 per cent.

Car and truck sales during this 8 months' period totaled 112,178, against 86,558 in the same period of the 1915-16 year. This is an increase of 25,620 vehicles, or a gain of 29.6 per cent.

March net profits totaled \$2,750,000 against \$1,633,000 in March a year ago. This is one of the largest comparative gains in any month of this fiscal year.

General Motors, despite high cost of raw materials and the general advance in cost of operation, continues to run strong in cash. As of April 25 the company had in the banks a total of \$23,475,000 against \$22,576,575 on July 31 last. In other words, the cash alone is \$3,475,000 larger than the par of the \$20,000,000 preferred of the new corporation.

CLINTONVILLE, Wis., April 28—Another four-wheel drive truck company is being formed in Clintonville. This is to be known as the Clintonville Duplex Truck Co. This is not the same concern as the Duplex company of Lansing, Mich.

MIDDLEFIELD, OHIO, April 26—The Charles Valve Remover Co. has been formed with a \$10,000 capital by Charles Wilkerson, E. H. Brigden and others to manufacture an automobile repair tool.

DOVER, DEL., April 26—The First National Finance Corp. has been formed to deal in automobiles, loan money upon security, etc. The capital is \$3,000,000. The incorporators are F. R. Hansell, G. H. B. Martin, S. C. Seymour, all of Philadelphia.

CLEVELAND, April 27—The Argue Lamp & Appliance Co. has been incorporated with a capital of \$100,000 to manufacture automobile lamps and other accessories. The incorporators are: Oscar M. Sheck, F. L. Norman, C. R. Welch, Robert McLaughlin and E. P. Strong.

ROCHESTER, N. Y., April 26—The Giant Tire & Sales Co. has been chartered to manufacture tires. The company is capitalized at \$10,000. The directors are: J. M. Johnson, L. Z. Johnson, A. L. Dutton, E. F. Gamrod and J. A. Huber. Offices are in the Carter Building.



## Standard Parts Earns 25%

### Company Closes Contracts for 150,000 Sets of Springs for One Car Builder

CLEVELAND, April 27—Earnings of the Standard Parts Co. during March were at an annual rate of more than 25 per cent on the common stock, which is larger than the rate in any of 3 preceding months. The company yesterday closed a contract to furnish a leading automobile maker with 150,000 sets of springs. While word comes from the automobile and allied industries that some of the companies are feeling the effects of the economy campaign, President Christian Girl says that his company has not experienced such effects, and adds that a certain automobile maker which recently had cancellations due to the economy movement has within the same period of time had new orders which doubled the number of cancellations.

### Wilson Body Secures \$1,000,000

BAY CITY, MICH., April 30—The C. R. Wilson Body Co. has secured \$1,000,000 in 3 and 5-year 6 per cent bonds for its plant in this city. The Wilson company uses the plant here for wood-working.

This company is negotiating with one automobile manufacturer for a contract for 30,000 automobile bodies. When this contract is closed the company will probably greatly increase its building and machinery capacity.

### United Motors Co. to Make Trailers and Tractors

GRAND RAPIDS, MICH., May 1—The United Motors Co. of this city will make trailers and tractors in addition to its present large motor truck line.

The company is erecting a number of buildings for this purpose including a woodworking building where the trailers will be manufactured. At present the trailers are being manufactured by outside concerns.

The tractor rights were acquired from the owner and a number of the machines have already been made and operated secretly, and found successful.

### New St. Paul Interests in Regal Motor Car Co.

DETROIT, April 30—The Lambert interests in the Regal Motor Car Co. have, in great part, changed hands. John Lambert and Charles Lambert have sold their interests in the company, though Bert Lambert retains an interest and will remain as a director of the company. The Lambert interest has been purchased by St. Paul, Minn., capitalists who are represented by Frank H. Shaw, now treasurer of the Regal company. Mr. Shaw was formerly in the banking business in St. Paul.

F. W. Haines remains as president of the company. H. H. Emmons has resigned as secretary and joined the United States Navy. He is succeeded by M. T. Boden who was formerly the treasurer of the company. Other officials remain as heretofore.

The Regal company is now producing ten to twelve cars daily and with the new working capital, expects to attain a capacity of twenty cars per day in the near future.

### Price Changes

Overland Big 4, 3-Pas. Roadster.	\$835	\$880
Overland Big 4, 5-Pas. Touring.	850	895
Overland Light 6, 3-Pas. Rdster.	970	1,010
Overland Light 6, 5-Pas. Touring.	985	1,025
Baker R & L, Bx7, 4-Pas. Coupe.	2,800	3,000
Baker R & L, Jx7, 5-Pas. Brohm.	3,000	3,200
Premier, 7-Pas. Tourer.	1,895	1,985
Premier, 4-Pas. Rdster.	1,895	1,985
American Six, 5-Pas. Touring.	1,285	1,375
Empire 6, 5-Pas. Touring.	1,235	1,285
Empire 6, 7-Pas. Touring.	1,265	1,315
Empire 4, 5-Pas. Touring.	960	1,125
Kent, 4-Pas. Roadster.	985	1,085
Kent, 5-Pas. Touring.	985	1,085

NEW YORK, April 27—The Baker R. & L. Co. will raise its prices May 1 \$200 on both of its models. On that date the model BX7 four-passenger coupe will sell for \$3,000. The JX7 dual drive brougham five-passenger model will sell for \$3,200.

NEW YORK, April 27—The Premier Motor Corp., Indianapolis, will raise its prices May 1 on both its models. On that date both the seven-passenger touring car and the four-passenger roadster will be raised in price from \$1,895 to \$1,985.

### 200 Per Cent Earnings for Michigan Copper

DETROIT, May 3—The Michigan Copper and Brass Co. is rumored at earning 200 per cent, or between \$400,000 and \$500,000, this year.

### Prescott Rings Bear Maker's Name

WEBSTER, MASS., April 28—The Prescott Auto Parts Co. has established a branch in Chicago at 910 South Michigan Avenue. Prescott rings hereafter will be stamped with the name of the manufacturer.

### Military Axle Types

In its preliminary report of the specifications of military trucks drafted by the War Department in co-operation with the Society of Automotive Engineers, THE AUTOMOBILE stated that preference would be given to final worm drive, which information came from authoritative sources. When the complete draft of specifications for 1½ and 3-ton trucks was issued it was discovered that all types of axles were included. The specifications with regard to type of drive are:

Type of Drive: The trucks may be provided with any suitable standard type of drive such as internal gear, bevel gear, worm gear or chain drive. Preference will be given to that type of final drive which provides the greatest amount of ground clearance in conjunction with provision for retaining grease or oil and excluding dirt.

## Fisher Body Earns \$5.56 a Share

### 6 Months' Service Is \$1,288,836—Net Income \$1,463,836—Assets \$11,381,788

NEW YORK, April 26—The Fisher Body Corp. has filed with the New York Stock Exchange the following consolidated statement of income of the parent company and subsidiaries for the period Aug. 21, 1916, to Feb. 28, 1917:

Profits from operations.....	\$1,369,730
Other income—interest, rentals, etc.	94,106
<b>Total net income.....</b>	<b>*\$1,463,836</b>
Dividends paid on preferred stock.	175,000
<b>Surplus.....</b>	<b>\$1,288,836</b>

\*After allowing for full dividend requirements of 7 per cent on 50,000 shares of preferred stock, the balance applicable to the common stock is equivalent to \$5.56 a share earned during the above period on 200,000 shares of common stock.

The consolidated balance sheet as of Feb. 28 shows:

Assets.	
Land and buildings.....	\$2,735,591
Machinery and equipment.....	1,784,186
Patents.....	250,020
Cash on hand and in banks.....	642,843
Accounts receivable.....	2,282,812
Raw materials (at cost).....	1,939,302
Work in process (at cost).....	1,719,998
Deferred charges to future operations.....	47,033
<b>Total.....</b>	<b>\$11,381,788</b>

Liabilities.	
7 per cent cumulative preferred, 50,000 shares of \$100 each.....	\$5,000,000
Balance, as of date of organization, represented by 200,000 shares of common of no par value.....	2,111,324
Notes payable—bank.....	1,480,000
Building loans—bank.....	300,000
Accounts payable.....	773,456
Accruals.....	200,127
Reserves—Depreciation, war tax, etc.....	228,042
Surplus.....	1,288,836
<b>Total.....</b>	<b>\$11,381,788</b>

### \$417,140 Earned by Paige in Quarter

PHILADELPHIA, April 30—The net earnings of the Paige-Detroit Motor Car Co. for the quarter ending March 31 were \$417,140 which is 23.83 times the preferred dividend requirements for the quarter. After deducting the quarterly preferred dividend requirements of \$17,500 there remains an amount applicable to the common stock of 26.6 per cent or on the basis of 106 per cent per annum.

### Gray & Davis Average \$100,000 Monthly

BOSTON, MASS., May 1—Gray & Davis averaged \$100,000 per month during the March quarter. These earnings are only in part from war work. The floating debt situation is showing steady improvement. In the last few months there has been a sharp cutting down in the amount of outstanding notes.

### Locomotive Assets \$15,218,431

BOSTON, April 26—The Locomobile Co. of America, Bridgeport, Conn., has filed an abstract of certificate of condition

under the business corporation law of Massachusetts showing total assets and liabilities of \$15,218,431.50. Real estate is valued at \$186,500, and its machinery at \$2,793,578.34. Merchandise, including manufactures, material, and stock in process, is valued at \$5,395,668.99. Patent rights, trade marks, good will, are given at \$5,494,579.78. The capital stock is \$6,250,800, paid in, the authorized capital stock being \$6,500,000. Accounts payable total \$336,370.23. The funded indebtedness amounts to \$1,863,500, the floating indebtedness to \$4,293,457.45, and the surplus to \$1,585,903.96. Profit and loss reserves total \$888,399.85.

**\$542,000 Profits for Stewart-Warner**

CHICAGO, April 30—The Stewart-Warner Speedometer Corp. reports profits for the first quarter of \$542,000 as against \$571,000 for 1916. This year it has been necessary to get up a heavy reserve to cover the increase in the Federal Income Tax, and in general. The business was excellent for March, having been the largest month in the history of the corporation.

**DIVIDENDS DECLARED**

Mitchell Motors Co., quarterly of 1½ per cent, payable May 24 to stock of record May 10.

Yale & Towne Mfg. Co., extra of 5 per cent, payable May 21 to stock of record May 14.

Republic Rubber Co., quarterly of 2 per cent on common and 1½ per cent on preferred.

Studebaker Corp., quarterly of 1¼ per cent on preferred and 2½ per cent on common, payable June 1 to stock of record May 19.

**Automobile Issues Stronger**

**General Motors, Chevrolet, United Motors and Stewart-Warner Show Gain**

NEW YORK, May 2—Automobile issues were a little stronger last week, occupying a prominent position in the activities of the securities market. General Motors, Chevrolet, United Motors and Stewart-Warner were especially active. The unusual activity in General Motors preferred revived discussion of the possibilities of a plan for retiring the preferred stock and clearing the way for the common. Chevrolet sold up to 102 and United Motors, the most heavily traded in of all the Curb industrials, swung up from a low of 29¼ to a high price of 33½.

United Motors' rise was made easy by the fact that heavy selling has been going on for a long time, and the stock is now technically in fine condition for a rise. Stewart-Warner was strong on report of a record business in March. The company is operating to full capacity and is booked to the limit for most of this year.

**Field Motor Sells Stock**

GRAND RAPIDS, MICH., April 28—The Field Motor Co. is increasing its working capital by an issue of \$200,000 common and non-assessable stock. This is a portion of the \$300,000 issue available for public purchase.

The Field company manufactures a

four-cylinder, double-opposed engine, using low-grade oils and fuel. It operates with a standard carbureter, requiring no readjustment. One prominent tractor manufacturer has a standing order for 5000 engines annually, and other tractor manufacturers are interested.

**Offers Tractor Stock to Public**

ANN ARBOR, MICH., April 27—R. T. Dobson, of this city, is offering the stock of the One-Man Underslung tractor plow and tractor to the public at \$10 per share.

Mr. Dobson has purchased the entire company and will incorporate it for \$500,000, of which stock to the amount of \$250,000 or \$300,000 is being offered at this time. Instead of selling stock now Mr. Dobson is accepting reservations. The One-Man tractor is now working daily on several farms near Ann Arbor.

**Dayton Rubber \$400,000 Stock Issue**

CINCINNATI, April 30—The Dayton Rubber Mfg. Co., Dayton, will issue \$400,000 of its preferred stock through Chatfield & Co., investment broker. The proceeds of the stock issues are to be used to finance the construction of a new factory in West Dayton. The preferred stock will be 7 per cent. The issue is callable at 115 and accrued dividends. Application to list on the Cincinnati Stock Exchange will be made.

**Capital Change**

ALBANY, N. Y., April 26—The Bijur Motor Lighting Co. has increased its capital from \$650,000 to \$2,000,000.

**Automobile Securities Quotations on the New York and Detroit Exchanges**

	Bid	Asked	Net Ch'ge
*Ajax Rubber Co.	67½	70	+ ¼
*J. I. Case T. M. Co. pfd.	83	86	..
Chalmers Motor Co. com.	..	22	..
Chalmers Motor Co. pfd.	..	..	..
*Chandler Motor Car Co.	95	100	+2
Chevrolet Motor Co.	102	105	+4
Fisher Body Corp. com.	..	38	..
Fisher Body Corp. pfd.	90	93	—4
Fisk Rubber Co. com.	70	75	..
Fisk Rubber Co. 1st pfd.	103	106	..
Fisk Rubber Co. 2d pfd.	..	..	—5
Firestone Tire & Rubber Co. com.	127	131	..
Firestone Tire & Rubber Co. pfd.	106½	108	+ ½
*General Motors Co. com.	108½	109	+6¼
*General Motors Co. pfd.	91	91¾	+4¼
*B. F. Goodrich Co. com.	51½	51½	+3¼
*B. F. Goodrich Co. pfd.	107	108	..
Goodyear Tire & Rubber Co. com.	210	215	—5
Goodyear Tire & Rubber Co. pfd.	106½	108	+ ½
Grant Motor Car Corp.	5	8	..
Hupp Motor Car Corp. com.	3½	4½	..
Hupp Motor Car Corp. pfd.	74	80	—1
International Motor Co. com.	..	16	..
International Motor Co. 1st pfd.	..	70	..
International Motor Co. 2d pfd.	..	30	..
*Kelly-Springfield Tire Co. com.	52	55	+2
*Kelly-Springfield Tire Co. 1st pfd.	88	94	+1
*Lee Rubber & Tire Corp.	19¾	20½	— ¼
*Maxwell Motor Co., Inc., com.	49½	50½	+1
*Maxwell Motor Co., Inc., 1st pfd.	64	67	—2
*Maxwell Motor Co., Inc., 2d pfd.	31	31½	+1¼
Miller Rubber Co. com.	205	215	—10
Miller Rubber Co. pfd.	104½	105½	..
Packard Motor Car Co. com.	..	160	..
Packard Motor Car Co. pfd.	..	101	..
Paige-Detroit Motor Car Co.	33½	35	+4¼
Peerless Truck & Motor Corp.	12	15	..
Portage Rubber Co. com.	143	149	—2
Portage Rubber Co. pfd.	..	..	..
Regal Motor Car Co. pfd.	..	24	..
Reo Motor Car Co.	31½	32	+3¼
*Saxon Motor Car Corp.	47½	50	—2¼
Springfield Body Corp. com.	60	70	—2

	Bid	Asked	Net Ch'ge
Springfield Body Corp. pfd.	100	120	—2
Standard Motor Construction Co.	13	13½	..
*Stewart-Warner Speed. Corp.	80½	81½	+7
*Studebaker Corp. com.	87½	88	+2½
*Studebaker Corp. pfd.	104½	106	+ ½
Swinehart Tire & Rubber Co.	65	75	—5
United Motors Corp.	33½	33½	+3½
*U. S. Rubber Co. com.	57½	58½	— ½
*U. S. Rubber Co. pfd.	106¼	108	+ ¼
*White Motor Co.	45¾	47	+ ¾
*Willys-Overland Co. com.	30	30¾	+ ¾
*Willys-Overland Co. pfd.	95½	96	..

\* At close April 30, 1917. Listed New York Stock Exchange.

**OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE**

**ACTIVE STOCKS**

	Bid	Asked	Net Ch'ge
Auto Body Co.	..	31	..
Chalmers Motor Co. com.	..	..	..
Chalmers Motor Co. pfd.	..	..	..
Continental Motor Corp. com.	7	7½	..
Continental Motor Corp. pfd.	97	99	+ ½
Ford Motor Co. of Canada	..	280	..
General Motors Co. com.	..	..	..
General Motors Co. pfd.	..	..	..
Maxwell Motor Co. com.	..	..	..
Maxwell Motor Co. 1st pfd.	..	..	..
Maxwell Motor Co. 2d pfd.	..	..	..
Packard Motor Car Co. com.	145	151	..
Packard Motor Car Co. pfd.	..	100½	..
Paige-Detroit Motor Car Co.	34¾	35	+4¼
Prudden Wheel Co.	27½	..	..
Reo Motor Car Co.	32	32½	+3¼
Studebaker Corp. com.	..	..	..
Studebaker Corp. pfd.	..	..	..
C. M. Hall Lamp Co.	23	25½	..

**INACTIVE STOCKS**

Atlas Droo Forge Co.	..	..	..
Kelsey Wheel Co.	..	..	..
Regal Motor Car Co.	..	26½	..

## Tractor To Solve Food Problem

More Needed to Increase Crop  
—Horning Talks on Ultimate Tractor Engine

MINNEAPOLIS, April 30—The importance of this city, and this section of the country, in the solution of the problem of the world's future food supply was emphasized by H. L. Horning, addressing seventy-five members of the Minneapolis Section of the Society of Automotive Engineers, because here is concentrated the center of the food supply of the United States and tractor industry. He said:

"The tractor is the solution of the food problem. The difficulty now is to get material and labor for the industry. To increase the supply of tractors is the call of to-day."

As chairman of the S. A. E. committees on tractors and fuel, Mr. Horning reported a conference with the National Council of Defense and its agreement of the importance of the tractor in the food problem as being capable of greatly increasing the crop. He reported progress in standardizing fuels and probable low cost as the result of new processes of cracking. The gist of his morning paper was that the four-cycle, four-stroke vertical type, with the early application of kerosene, is the ultimate type of tractor engine.

This should be capable of delivering 16 to 40 hp. continuously without distress at full load, or over, at from 750 to 1230 rev.

Questions by members brought out the importance of understanding the combustion chamber in developing the engine and determining correct compression, that the lightest compatible lubricating oil should be used and that constant level splash is the best lubricating system, though force feed also has possibilities.

### Technical Board Formed by Packard

DETROIT, April 30—Because of the increasing importance of standardized service the Packard Motor Car Co. has

formed a technical service board composed of experts from the eight largest points in the Packard organization. The board will convene monthly at the factory under the chairmanship of C. R. Lester, who is the technical service manager. It is the intention of the organization to consider in detail general conditions of service.

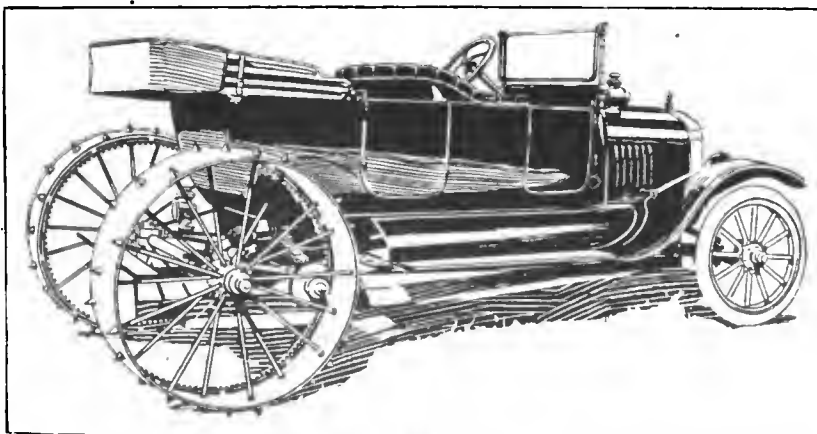
### New Tractor Uses Oscillating Driving Drums

DETROIT, April 30—William Turner, a ranch owner of Washington, has invented a tractor and successfully demonstrated it on his western farms. The tractor weight is evenly distributed on two large driving drums which oscillate, and enable the tractor to cover any uneven surfaces of ground. It is constructed with a low center of gravity to allow it to be driven on side hills without turning over, is driven by a gasoline engine and has a large platform for carrying heavy loads of farm products. It will turn in its own area.

### Smith Attachment Converts Fords into Farm Tractors

CHICAGO, April 30—The Smith Form-A-Tractor Co. has recently organized in Chicago by practically the interests now controlling the Smith Motor Truck Corp. and will place on the market an attachment for converting the standard Ford touring car into a farm tractor. The attachment will sell for \$255 and it is stated that any Ford can be made a tractor in 15 minutes without the necessity for any machine work.

The attachment consists of a channel section frame which attaches to the Ford front axle, extends under the Ford chassis beyond the rear axle and is connected with a dead tractor axle made of 2-in. cold rolled steel which is designed to receive two tractor wheels. The work of transformation is completed by removing the Ford rear wheels and replacing them with driving pinions designed with a keyway, to fit into the key of the Ford axle, the driving pinions fitting over the brake drums and brake bands and retaining all the braking features of the Ford car.



Smith Form-a-Tractor, which converts a Ford into a tractor in 15 min. without machine work

## Urges Standard Ignition Parts

H. E. Rice Emphasizes Heavy Expense Entailed by Great Number of Special Parts

PHILADELPHIA, April 26—The necessity of standardizing certain parts in connection with battery ignition systems was emphasized at the monthly meeting of the Philadelphia Section, Society of Automotive Engineers, held in this city tonight. The speaker, H. E. Rice, sales manager of the Atwater Kent Mfg. Co., was emphatic with regard to the needs of standardization. The large number of small fittings needed because of special installations gave rise to the suggestion and Mr. Rice believes that one or two standard ignition mountings could satisfactorily take the place of the large variety now used. Mr. Rice further suggested that ignition makers as well as manufacturers of motors and complete cars would welcome such activity in standardization work.

Here is how Mr. Rice expressed himself on this:

"The general details of ignition installation are in great need of standardization, and it is a relief to realize that the standards committee have this general subject under consideration. At present the vast number of special fittings and special installations required is an enormous manufacturing burden and an important cost factor. Any standardization which will make it possible for one or two standard ignition mountings to take the place of the large variety now used should be welcomed.

"It should be possible to standardize the socket or mounting which holds the ignition distributor so as to make all of them interchangeable. I will submit photographs showing six different distributor shanks which the concern with which I am connected now furnishes to various car manufacturers, and even with six shanks from which to choose, we are still frequently asked to manufacture special shanks.

"The ignition drive shaft and connection is another detail worthy of comparison. We now must make up a wide variety of shafts as well as shanks, and the shaft situation is even more serious because we must be able to supply them for four, six and eight cylinder motors, multiplying the necessary varieties by three.

"Ignition equipment installation can be standardized as readily as any other electrical or mechanical equipment, and it is doubtless only a matter of time when it will be done. I believe, however, that the mechanical details of installation which are now suggested for standardization are capable of further refinement, reductions in some dimensions can be made with resultant economies, and it is possible that the standards now established may have to be supplemented at some later time."

Mr. Rice stated that out of 108 auto-

mobile makers eighty-six are to-day fitting battery ignition systems as compared with twenty-two using magneto systems. Of the latter many are using dual magneto systems which he described as being virtually battery systems.

In reviewing the development of ignition apparatus, he pointed out that ignition equipment represents only about 1 per cent of the total cost of the complete car, but is 100 per cent important to the operation of the car.

"Battery ignition," he said, "may be divided into two general types and classified as open circuit and closed circuit systems. In each system the elements are almost identical, consisting of a combination, low-tension circuit breaking and timing device, a transformer coil with primary and secondary windings, and a distributing device for connecting each spark plug in its proper order to the high tension winding of the coil.

#### Little Energy Consumed

"The open circuit contact maker is so designed as to close the circuit of the transformer coil momentarily for each spark, the time interval being uniform at all motor speeds. The time during which the primary current flows through the coil is approximately 0.033 sec. for each spark. The current flow for this brief instant is about 4½ amp. but the time is so short that the energy consumed is almost negligible; a six-cylinder system requires less than 0.6 amp. at highest motor speed and dry cells are economically used for current.

"In the closed circuit system the same elements are used except that the contact maker is operated by direct cam action and the electrical windings are proportioned differently. The form of the contact maker has been evolved from the magneto and consists of a simple arm carrying a contact point and controlled by a spring to bring the contact together. The contacts are separated by the action of the cam on the timer shaft.

"By reason of this simple cam action, the circuit is closed for a longer time interval than with the open circuit system and the contact varies with the speed—a long contact at low speed becoming shorter as the speed increases.

"This is a much simpler type of contact maker than required by the open circuit system, but it takes more current, and should the circuit be left open with the motor closed, the battery will be discharged at a rate limited only by the resistance of the primary circuit.

"The current characteristics of the closed circuit system are the reverse of the open circuit system. The former takes a maximum current when the motor is not running, falling as the motor starts and reducing with speed. In the open circuit system, current consumption is zero at zero speed and increases in direct proportion to the speed. While the open-circuit system is widely and successfully used, the closed-circuit system undoubtedly is simpler in construction and its manufacturing cost is considerably lower. It is therefore in wider use than any other type."

## Bad Truck Bills in New York

### One Requires Tires Double Present Width—Other Limits Gross Weight

ALBANY, N. Y., April 30—Commercial vehicles in this State will be hard hit if drastic bills are passed requiring all trucks mounted on solid tires to be provided with tires double the width of those now used. The allowable maximum wheel loads would be from 25 to 50 per cent less than those recommended by all solid tire manufacturers. The Motor Truck Club has been fighting this bill and has succeeded in having it held off until the next meeting of the Legislature.

Besides the tire load capacities proposed, the bills, introduced by Assemblyman Kasson and Senator Robinson, also seek to limit the gross weight of all vehicles to 28,000 lb., except by special permit; the gross weight on any axle to be 20,000 lb.; total weight signs or plates attached to each vehicle; limit the length to 28 ft. and width to 8 ft.; and regulate the speed according to the tire width. The last named is unsatisfactory for those trucks which use singles in the front and duals in the rear. This would restrict them to two different speeds.

#### N. Y. Traffic Bill Passed

ALBANY, N. Y., May 2—The Welsh bill for uniform traffic regulations throughout the state was passed by the Assembly and sent to the Senate last night. The bill has been amended so that it does not apply to the city of New York. It provides a system of signals for movements of all vehicles and makes the speed limit driving that does not endanger other users of the highways.

#### Crowther Sale Ordered Discontinued

BUFFALO, N. Y., April 27—Sale of the property of the Crowther Motors Co. was ordered discontinued yesterday in the United States district court. The Crowther company recently filed a bankruptcy petition. Helen E. Martens, who holds a mortgage valued at \$25,000 against the company, recently started an action in the Supreme Court of Monroe County to recover on the mortgage which she could not proceed after the bankruptcy petition was filed. On order by the United States district court she can continue her action.

#### Status of Foreign Patents in United States Unchanged

WASHINGTON, D. C., April 27—The status of patents held in this country by residents of foreign countries now at war with the United States will remain unchanged for the present, according to Thomas Ewing, Commissioner of Patents.

The laws of the United States provide that in emergency the Government can take over and make use of any

patents. If the output of any manufactured article controlled by a patent is inadequate, the Government can authorize the manufacture by another concern, the amount of damages to be adjusted later in the courts.

All of the warring powers except Russia and Germany have agreed to keep in force patents already granted to enemies.

#### Discontinue Time Payments on Trucks

NEW YORK, April 26—The National Bond & Investment Co. and the Empire Securities Co., both of Chicago, have discontinued for the time being the handling of time-payment paper for truck dealers. The Bankers Commercial Corp., this city, will not accept any further paper on passenger cars, but has not withdrawn so far as trucks are concerned. The other concerns are continuing in the work without serious modification due to war finances.

#### No Receiver for Gibney Tire

PHILADELPHIA, April 28—Stockholders of the Gibney Tire & Rubber Co., Conshohocken, successfully opposed an effort by council to have the Federal Court appoint a receiver for the company yesterday. At this hearing before Judge Thompson it was alleged that the resolution of the Board of Directors admitting insolvency was illegally procured. Creditors claim that the company's liabilities are about \$800,000, which they allege is in excess of its assets.

#### Double Tax for N. Y. Automobiles

ALBANY, N. Y., April 30—Passenger car owners in this State are to be taxed doubly as a war measure, according to Senate Bill No. 2047, introduced by the Committee on Taxation and Retrenchment. It is expected that if this measure should pass it would bring into the treasury of the State about \$2,000,000 in addition to the taxes already placed on passenger cars. The measure would become effective immediately, and on all cars purchased on and after Aug. 1, 1917, and up to and including July 31, 1918, the purchasers would be compelled to pay twice as much for license plates as they must pay at present.

Automobilists have been promised that the bill will be amended so that any tax paid by them to the Federal Government shall be deducted from the increase they must pay to the State if the bill becomes a law.

#### Auto-Kamp Co. Enlarging Plant

SAGINAW, April 30—The Saginaw Auto-Kamp Co., which makes trailers, is enlarging its plant and will increase its production to twenty-five trailers a day.

#### Wisconsin May Raise Automobile Fees

MADISON, WIS., April 29—A state highway bill providing for a 5,000 mile road system connecting every county seat in Wisconsin has passed the assembly and awaits the signature of the governor. An increase of automobile license fees from \$5 to \$10 is one of the provisions.

## Canada Expects To Buy 30,000 Cars

Sales for 1917 May Reach That Total—Farmer Is Best Buyer

MONTREAL, QUE., April 27—Canada is expected to buy 30,000 cars in 1917. Since 1914 some 20,000 cars have been sold annually in Canada. Last year the figures reached 28,000. The big automobile market is in the middle western provinces, where the farmer has become the best customer. The profits from the crops of the last 2 years have helped to swell the sales of the automobile industry in Canada. The three western provinces, Manitoba, Saskatchewan and Alberta, invested \$45,000,000 in automobiles in 1916, and in tires and accessories over \$7,500,000. The great increase in sales in the last 2 years means that every man who owns a car now makes two prospective buyers for some distributor for the coming year.

### Cadillac Wins Honors in Japanese Army Tests

TOKIO, JAPAN, April 30—The Cadillac Eight, manufactured by the Cadillac Motor Car Co., recently won highest honors in a series of tests arranged by the Japanese army. Representatives of five American cars were invited to enter a competitive demonstration. When all had finished the officers asked each one to haul a nearby gun up a steep grade. The gun weighed 2½ tons. Three of the dealers declined to compete, the fourth ruined his frame in the attempt, and the Cadillac was then attached to the gun, got it under way in low gear, shifted to second speed and negotiated the grade.

### Manly Truck Adds Equipment

CHICAGO, April 27—The Manly Motor Corp., maker of Manly trucks, has added a kerosene burning equipment costing \$100 to its Models 30 and 50, 3000 and 5000 lb. trucks. Other equipment includes electric starting and lighting, \$125 additional; electric lighting only, \$75 additional, and enclosed cab in place of seat, \$35 additional.

### Cassidy Adds Tenion Piston Ring

NEW YORK, May 2—The Edward A. Cassidy Co. will handle the sales of Tenion piston rings manufactured by the Du Bois Piston Ring Co. The Cassidy company has been studying Tenion rings which were formerly called Du Bois and submitting them to engineering tests for several months. The Cassidy line now comprises the Conophore, Kimball jack, Cassco tire pump, long horn, G-P muffler cutout and Tenion piston ring.

### Friestedt Enlarges Scope

CHICAGO, April 28—Friestedt Mfg. Co. is the new name of the Friestedt Rim Contractor Co. The change in

name has been made to coincide with the larger scope of the company, which is now marketing what is termed a hydronizer in addition to its rim contractor. The hydronizer is a glass container which clamps to the intake manifold and permits small quantities of water, kerosene or alcohol to be drawn into the mixture to prevent carbon deposit.

### Prest-O-Lite Wins Freight Increase Protest

WASHINGTON, April 30—The Interstate Commerce Commission has found in an official opinion that the proposed increased freight rating on coppered or nickeled cylinders by railroad carriers under a Southern classification order is not justified, and such increase has been denied. The proposed increase was protested by the Prest-O-Lite Co., Indianapolis, which showed that it shipped cylinders, generally empty, from Speedway, Indianapolis, to charging plants throughout the country, the principal one being at Atlanta, to be filled with gas and sent to consuming points.

Four styles of these cylinders, valued at about \$15,000,000, are in use. The carriers contended that transportation conditions always present with coppered or nickeled cylinders and not appertaining to other cylinders justified an increased rate. The commission held that no reason exists for making a distinction as between cylinders coppered and nickeled and those not coppered and nickeled.

### Dickson Urges Indianapolis To Put Clock Ahead 1 Hr.

INDIANAPOLIS, May 1—George M. Dickson, president of the National Motor Car & Vehicle Corp., has written a letter to Joseph E. Bell, mayor of Indianapolis, urging the mayor to issue a proclamation asking the people and manufacturing interests to set all clocks forward 1 hr. Mr. Dickson believes this should be done as a patriotic measure to provide another hour of daylight for persons who are tilling ground as a means of assisting the Government to prosecute its part in the war. According to Mr. Dickson by far the majority of the employees of the National company favor such an action.

### 50,500 Registered in Georgia

SAVANNAH, GA., April 27—To date 50,500 automobile tags of the 1917 vintage have been sold by the Secretary of State.

### Doble Agent in Detroit

DETROIT, April 30—The Owen, Graham & Starkweather Co. will market Doble steam cars in this territory. Its quarters are with the Owen & Graham Truck Co. Mr. Starkweather will have the active management and sales direction, but will also continue his present position as branch manager of the Buick Motor Co.

## 7000 Ford Cars in Argentina

Sell for \$1,700—Big Sales in Camp Areas—700 Cars Behind in Orders

NEW YORK, April 28—A. H. Lloyd Davies, assistant to E. H. Hampton, manager of the Ford branch at Buenos Aires, Argentina, and who has been visiting in the United States for some weeks, returned to Buenos Aires a few days ago. Mr. Davies states that there are at present 7000 Ford cars in Argentina, and that his branch started assembling last October. The assembly branch has capacity for forty cars per day, but this number is rarely reached due to scarcity of materials. At present 230 men are employed in the Ford activities in Buenos Aires, these being connected with the assembly work, retail and wholesale, service, etc.

One year ago Ford cars were selling for \$2,000 (Argentine pesos), but since assembly has been started the price has been reduced to \$1,700 (Argentine pesos). Mr. Davies reports that it is possible to secure good labor for assembly purposes. His concern takes unskilled help and trains it, which is accomplished in a relatively short time.

Although agricultural conditions have been very poor in many parts of Argentina during the past summer, which ended a few months ago, the Ford company is behind 700 orders at present. In addition to selling touring cars it is disposing of many chassis which are fitted with delivery wagons. At present 85 per cent of the sales are going into the country or camp areas. There are at present seventy Ford dealers in Argentina and as many sub-dealers. Each year finds the territory of the dealers and sub-dealers reduced in area, notwithstanding which the sales for each is increasing. The Ford company is pushing forward its system of country-wide salesmanship the same as it so successfully accomplished throughout this country. While the Buenos Aires factory is serving only Argentina the Ford company is working the South American territories very carefully. It has at present three special men traveling practically all through Brazil organizing the field. While the Ford branch at Buenos Aires is assembling mostly cars of 60-in. tread at present it is expected that soon only cars with 56-in. tread will be produced.

## Oppose Unjust Taxation!

(Continued from page 845)

chines are going to be content with the old model for a year or perhaps longer.

To-day the automobile industry is in no robust condition to absorb such a 5 per cent class war taxation as this. The automobile makers want to pay their share and are willing to pay it in the

form of excess profit taxes on their business as necessary. Under this excess profit tax arrangement the manufacturer pays proportionately to the government on his profits. If he does not make money he can scarcely be expected to carry his share and would not have to. Proportionately as he makes money he contributes to war taxation.

#### Ford Not Real Criterion

Unfortunately political Washington measures the automobile industry by the Ford annual statement. This has been known for a year or so. Heretofore it has been accepted, but not considered serious. To-day this estimate of the industry is serious and must be counteracted.

Ford is not and should not be considered a correct criterion of the industry. His business in proportion to others is greatly abnormal. The Ford business is practically without parallel. Washington fails to realize that too many of our automobile companies have been doing a large production business on too small, in fact ridiculously small capital. They have been able to do this so long as the curve of demand and production and prices was favorable. But with war, higher materials and decreased production and war taxes, together with slackening of demand, several will be face to face with financial situations that they thought impossible a few months ago.

These are days when the automobile industry must look the situation square in the face. The facts must be put in black and white. It is no time to depend too generously on to-morrow. To-morrow is too uncertain a factor. Nobody can properly gage it. The automobile industry must curtail.

#### Production Reduced

Already production is being cut down from 25 to 40 per cent by many important concerns and others will have to follow in the wake of them. Too many dealers are now stocked full of cars. The first quarter of 1917 was the biggest automobile production quarter of the industry. Manufacturers kept up production schedules and have loaded the dealers. These dealers find cars not moving as rapidly as they expected. Late spring weather is holding back many sales. A great many others are being held back because people refuse to make heavy investments in the present day, when prices for every commodity are going higher and higher. While cancellations are not very conspicuous at present, dealers report failure to make many sales which were expected to be closed weeks ago. Such conditions are general and should serve as warning to automobile manufacturers. These are not days of expansion but days of judicious contraction and protection.

The present time is particularly inopportune for class legislation of this nature. There are two reasons for this:

*Reason 1. The government has no right to resort to class legislation which taxes one industry and not others.*

*Reason 2. It is poor policy to attempt to place class legislation burdens on an*

*industry at a time when for various reasons it gives indication of depression and slackening, such as the automobile industry does to-day.*

In many States consumers may have to face heavily increased registration taxes. In addition, in all probability, a 2 cent per gallon tax may be placed on gasoline. Some of these measures must become law. We are in war and have to raise approximately \$2,000,000,000 per year and the automobile industry will have to bear its legitimate share, and bear is cheerfully.

#### Coffin Opposes 5 Per Cent Tax

Howard E. Coffin of the Council of National Defense, said to-day the automobile manufacturers of the country were united in their willingness to aid their country in the present emergency as far as paying a fair and just proportion of war taxes was concerned, but that they would protest against such a tax at the source as is reported to have been recommended by the sub-committee of the ways and means committee.

Mr. Coffin said such a tax, in addition to the excess profits tax, which is expected to be increased, would not be equitable from any viewpoint, and especially in view of the support the motor industry is giving the government. No hearings are to be held by the ways and means committee, and any action taken by motor interests after a bill is reported out will have to be in connection with individual members of Congress. Congress has always heretofore shown an inclination to treat the motor industry fairly.

#### France Feels Gasoline Shortage

CHICAGO, April 29—According to a cable received by the *Chicago Daily News*, strict measures are being taken by the French minister of supplies, M. Violette, for conserving the use of gasoline. Only 8 gal. a week is allowed to users of automobiles which do not come under the category of public interest, such as taxicabs, ambulances, etc. These cars are allowed 14 gal.

#### Studebaker to Build New Machine Shop

SOUTH BEND, IND., May 1—Plans for a new concrete and steel machine shop to be 225 by 576 ft. have been announced by the Studebaker Corp. The building, which is to be erected as soon as possible, will comprise only one-fourth of the entire structure which the company intends to build in the near future. When the entire one-story building is completed it will measure 428 by 1000 ft.

#### Fickling Adds Storage Department

NEW YORK, April 30—The Fickling Enameling Corp., Long Island City, has added to its plant a department for the storage of cars and bodies. Following are the rates: Closed cars, first month \$12, additional months \$8.50; touring cars and runabouts and chassis, \$10 and \$7.50; closed bodies, \$8 and \$6.50; touring bodies, \$6.50 and \$5. These prices include jacking up cars and supplying covers.

## Harkness Takes Sheepshead

### Pays Off \$2,135,161 Mortgages on Speedway—To Manage It Himself

NEW YORK, May 2—Another interesting chapter in the history of the big Sheepshead Bay Speedway was written yesterday when the property was offered at auction. The sale was the result of a foreclosure auction brought by Harry S. Harkness against the Sheepshead Bay Speedway Corp. As a result Harkness is now in complete possession, on a bid of \$1,300,000. The indebtedness against the property amounted to \$2,135,161.86.

The property, which consists of the speedway, stands, buildings and extensive grounds, was offered in two groups. The first group contains that property exclusive of the speedway; the second group contains that property embracing the motordrome, ground, stands, etc. The property was finally knocked down to Harkness on the above bid.

Mr. Harkness, it is stated, will manage the affairs of the speedway himself. His 1917 plans are undecided. He has had several of his racers on the speedway lately, however, which practically indicates his intentions of entering the 1917 racing events.

#### Three Short Races at Cincinnati

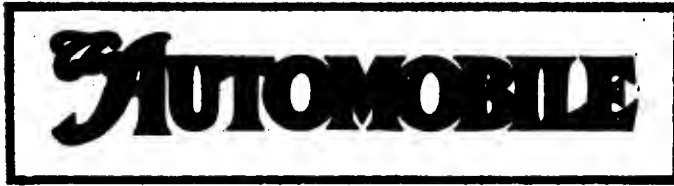
CINCINNATI, April 29—The Cincinnati Speedway officials have substituted three opening races instead of the amateur event scheduled for May 30. There will be a special race for Fords at 20 miles with three cups, valued at \$100, \$75 and \$50, as prizes. A stock chassis 20-mile race is scheduled with cups as prizes valued at \$150, \$75 and \$50. There will also be a special invitation race of 30 miles for Class E non-stock cars. The prizes will be three cups, valued at \$200, \$100 and \$75. These races will precede the 250-mile event.

A purse of \$25,000 has been offered for the 250-mile race, divided into \$10,000 for first; \$5,000 for second; \$2,500, third; \$1,750, fourth; \$1,500, fifth; \$1,100, sixth; \$900, seventh; \$800, eighth; \$750, ninth, and \$700, tenth.

Four entries to date have been made, as follows: Ostewig Special, driven by S. Ostewig; two Super-Six Specials, entered by the Hudson Motor Car Co., and driven by Mulford and Vail; and the Omar Special, driven by Omar Toft.

#### Three Foreigners to Enter Cincinnati Races

CINCINNATI, April 30—Joseph Christiaens, Enrico Cagno and Jacob Scales have entered for the Cincinnati speedway race May 30. Christiaens is in the Belgian aviation corps and Cagno and Scales are attached to the Italian army. Christiaens will drive an English Sunbeam and Cagno and Scales will drive Fiats.



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## Debt and Efficiency

**F**INANCIAL worries in the mind of the worker are much like a wrench in the gears of a machine. Destruction of productive ability, discord, costly mischief are the results. Every employer knows that great damage and injury is wrought when his workers become involved in debt.

The Cadillac Motor Car Co. has discovered a plan, recently described in *THE AUTOMOBILE*, that overcomes this evil. It is a plan that delves to the very foundation and forestalls garnisements, settlements with creditors, conferences with merchants and the mental agony the worker, involved, must suffer.

The company discovered that \$2,000 a year was left in its treasury by workers who failed to claim their wages—money commonly termed unclaimed wages. This sum is now turned over to the Cadillac industrial relations department and placed under the supervision of the company's attorney, who extends legal advice to employees. Workers in debt because of family illness or other reasonable cause visit the attorney, explain their troubles and make loans from the unclaimed wage fund.

The loans are repaid in installments depending upon what the employee believes he can pay weekly. He is cautioned against setting too high a figure. And the only security is his "word."

The plan has been found successful. It develops a loyalty toward the company, frees the workers

from hounding creditors and leaves them at liberty to think about their work.

It is a plan that other employers may, wisely, adopt. A canvass of the industry reveals that nineteen companies, including some of the largest and many of the smallest, have unclaimed wages amounting to \$25,329.74, which is credited to profit and loss or to the reserve fund. The average is approximately \$1,300 and is apportioned and controlled according to the number of employees in each plant. Thus it is, in most cases, sufficient to allow every concern to devote its unclaimed wages to the purpose of helping its employees.

## Combined Buying Power

**B**UYERS throughout the country are combining into a national organization. These men, who annually spend hundreds of millions of dollars, can be a wonderful power for good when combined into a national unit of sufficient size to have a considerable voice in the affairs of the world. Branches in local centers can afford chances for an exchange of ideas, opinions and news which will be of the utmost value in keeping in touch with the markets of the world.

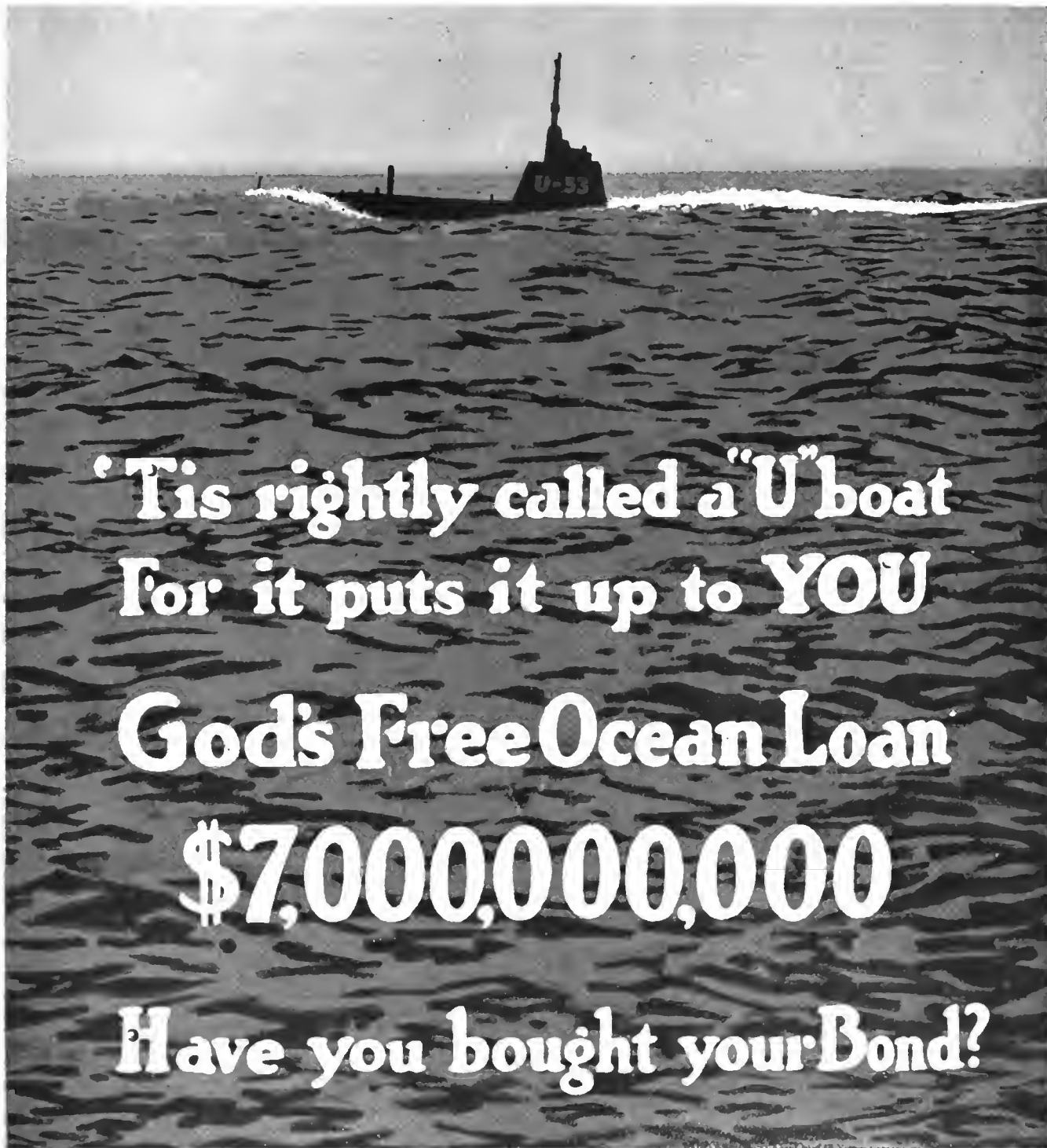
Buymanship is just as important as salesmanship in establishing a profit on a manufactured article. The organization of a great body of men who make it their life study to efficiently purchase goods can improve the ethics of salesmanship and buying to a wonderful degree, besides eliminating practices which cause waste and loss. When the great crowd who gathered at the recent salesmanship congress in Detroit is remembered, a crowd which the President of the United States felt it was worth his while to address, the possibilities of what lies on the other side of the buying fence may be realized.

A branch of the National Assn. of Purchasing Agents has just been established in Detroit. As is natural in that city, the nucleus of the local organization was largely made up of men in the automobile and allied industries, although the purpose is to expand this at once to other industries. Similar movements are going on at other points and the entire movement is so natural that the wonder is it has never before gained the impetus that it deserves.

## Hands Across the Sea

**C**O-OPERATION in furnishing tractor information to meet the pressing food problems of the day offered by cable to the Institution of Automobile Engineers in England and the Automobile Club of France by the Society of Automotive Engineers met with immediate appreciation and cordial response. This offer is another step toward closer relationships with European automobile engineers. Continued team work toward common ends should do much to advance the science of building automobiles and motor trucks as well as farm tractors. If relations thus fostered by the war are developed as they should be in the future the entire industry should be greatly benefited.

# Doing Our Bit



'Tis rightly called a "U" boat  
For it puts it up to YOU

God's Free Ocean Loan

\$7,000,000,000

Have you bought your Bond?

THESE bonds are to be issued in all sizes from \$100 up, it is understood. At the rate of \$2 a week one of these bonds may be bought in a year. The entire issue of \$7,000,000,000 means the equivalent of 70,000,000 bonds of the \$100 denomination. To absorb this loan, America's first popular contribution to the ex-

penses of the war, bonds must be bought by the population of the United States on the basis of \$100 worth to each one and one-half persons in the country. Of our 105,000,000 people there are millions who cannot afford even the \$2 a week required to buy one \$100 bond in a year. It is up to "You" to absorb the surplus.



# War Reveals Defects in Design

Clean-Cut Motor Design Important—Troubles with Lubrication  
—Thermo-Syphon Cooling Difficulties—Exhaust Manifolds Must  
Be Adequate — Chassis and Engine Accessibility Criticised

By W. F. Bradley

**EDITOR'S NOTE**—In this article Mr. Bradley, special correspondent of *THE AUTOMOBILE* with the allied armies, outlines in detail the chief troubles and defects brought out by war in the design of cars and trucks in the Italian service. During his work of several months as an ambulance driver, Mr. Bradley was in daily contact with army vehicles and the men handling them, so his knowledge of the subject is at once accurate and comprehensive.

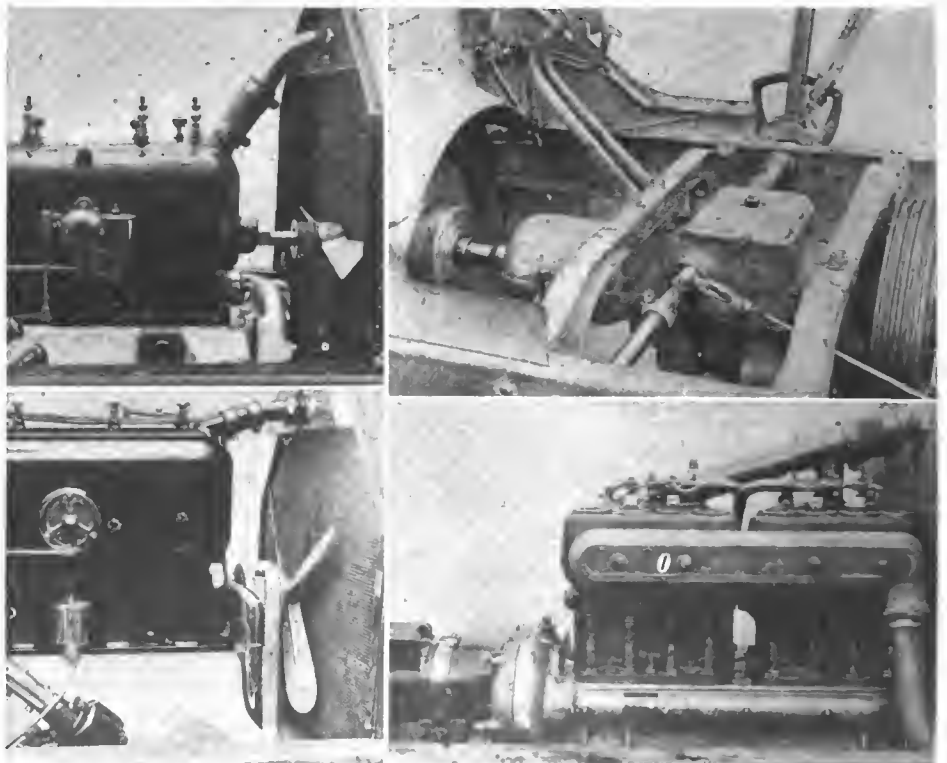
**I**NFINITELY more severe than the most difficult trials of automobile and motor-truck construction at the factories or in ordinary service is the great test of war. Moreover, special demonstrations of endurance, economy and performance usually start with a vehicle in good condition and manned by skilled drivers and mechanics. In war work, equal results must be attained with cars and trucks handicapped by a record of hard service and in the hands of mediocre drivers and without mechanical experts near to render repair service. A defect which can be tolerated in private service, because it is nothing more than an inconvenience, and can be prepared for and met under the most advantageous conditions, becomes a curse under active war work.

It is the intention in this article to point out some of the defects and weaknesses of Italian cars and trucks which have revealed themselves under active service. By this is not meant convoy work 15 or 20 miles behind the lines, where roads are good, shells are unknown, and, with proper organization, conditions need not be very much more severe than in private service. The experience covers vehicles which are constantly under fire. There are thousands of such vehicles on the various fronts of Europe. The expression "under fire" does not imply stretches of road on which shells are falling as thick as hailstones in a storm, nor has it very much in common with the illustrations prepared by artists thousands of miles from the front. Flying shell splinters are only seen by artists of imagination, but they are felt and heard daily, hourly by every automobile driver attached to the front-line forces. Working under fire does not mean that a car is disabled every time a shell bursts. Only mules and horses are irretrievably lost by splinters of shrapnel. An automobile may be within effective distance of hundreds of exploding shells, and, unless some essential organ happens to be hit, emerges none the worse for it.

The term does imply running over roads which can never be repaired, if we refuse to recognize the dumping of earth and bricks as repair work; it means going over

those roads at a fast pace, for it is beyond human nature to keep the foot off the accelerator pedal when the whistle of incoming shells is heard; it means driving at night in such black darkness that even the glow of a lighted cigarette in the mouth of a mechanic on an approaching vehicle is helpful and welcome; it means garaging the cars in some wrecked courtyard probably inches deep in mud; it means no facilities for washing, other than the river or a stream, when business is slack; it means doing all repair-work in the open air, with shells passing overhead in both directions; it means satisfaction with a very meager set of tools.

Clean-cut motor design is very much more important to the driver in the war zone than would appear at first sight. The conventional L-head type, with inclosed valves, bolted-on ribbed exhaust manifold—a straight length, integrally—cast intake manifold, with carbureter bolted direct to the cylinder casting, magneto and pump driven



Upper left—Here rear wheel brake adjustment is correctly placed under the floorboards. Upper right—A neat design of truck engine. Fan does not sweep a sufficient area of the radiator. Lower left—A good example of valve stem accessibility, but exhaust is restricted by sharp bend in manifold—this is almost inevitable with dashboard radiator. Lower right—A good example of clean Italian design. A Spa truck motor with water pump in cylinder casting and fan driven off same shaft



An ambulance with a broken axle about to be towed by a truck

from a cross shaft in front of the motor, and a belt-driven fan, constitute the cleanest motor, the most accessible, and the easiest to maintain. A motor of this type, which can be cleaned in 5 min. with the aid of a kerosene brush and a rag, is much more likely to be kept in proper condition by the average driver than an engine of complicated and inaccessible design.

#### Clean-Cut Engine Design Important

The valuable features of a valve-in-head motor are fully recognized, but they entail considerably more work than the type just described. There are eight push rods which call for very much more frequent adjustment than the inclosed tappets of the L-head motor. There are eight rocker arm ball joints which must be oiled once a day at least; there are four valve rocker shaft grease cups which also need daily filling. In hot weather, and if poor quality grease is given out, the lubricant will liquefy and disappear at such a rate that the cups have to be filled twice a day. This is unnecessary labor. On some engines the governor and timing gear housings have to be filled separately. This is a small matter on peace service, but it is very objectionable on strenuous war work. There is no necessity for a couple of long small-diameter breather tubes which also act as oil fillers. A very much better arrangement is a single big-diameter filler which also acts as breather. This naturally raises the question of oil control. The method of determining the level by a cock is not satisfactory, for if it is inside the mudpan it cannot be seen, and if outside, the mouth of the cock is very quickly coated with mud and rendered useless. A float and indicator arrangement was also found unsatisfactory owing to its liability to wedge, and on more than one occasion the float came adrift and was battered out of recognition by the connecting-rods. A float with a vertical rod was also unsatisfactory, for unless protected by a tube the rod was liable to be bent or broken. The most satisfactory method observed on the Italian front was that adopted by Fiat, and consisting of a big-diameter filler and breather, with a hinged, clip-down top; and below it, at the correct height, another mouth with a hinged cover, allowing the driver to look into the crankcase. To fill, the two lids were opened, and it was impossible for the driver to make any mistake about the level or to put in too much oil. It would overflow from the lower inspection hole when the correct height was passed. The only defect of this arrangement was the absence of a filter in the mouth of the filler. This filter

should have a big surface and be not very easily withdrawable, so that drivers will not be tempted to pour oil in direct.

War experience shows that an oil indicator is unnecessary. Glass sight-feeds, for instance, were absolutely useless, for after a few days the glass in one of these was so dirty that the flow could not be observed; in any case, it was not visible from the driver's seat, and it was very liable to be broken by an accidental kick with the foot. All the Italian cars used a glass-faced pressure gage, which generally worked satisfactorily, although the small-diameter copper pipe would sometimes fracture, or the glass be broken. Between 40 and 50 Buicks and G. M. C.'s have been working on the Italian front for a year and a half without any dashboard indicator, or without any attention being paid to it, and with both American and Italian cars the writer never heard of a single case of oil-pump failure. What is needed is a very simple and reliable oil level, but the oil indicator can be

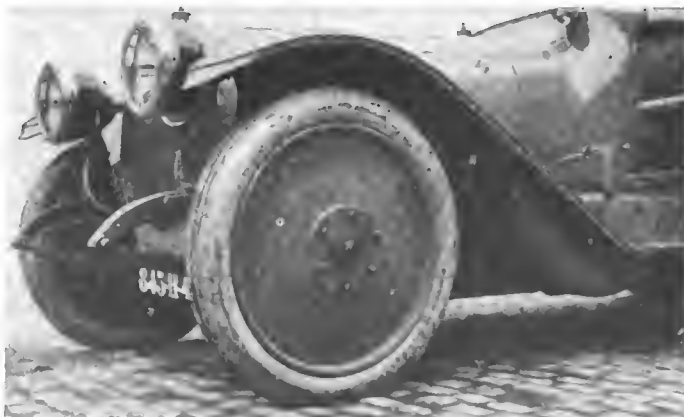
abolished as unnecessary. A few firms have realized this, the French Darracq, some Delages and Panhards, for instance, now being without indicators.

It is an easier matter to get drivers to verify the oil level than to keep an eye on the oil indicator; certainly the man who would not trouble to verify his oil would not watch a dashboard indicator. Even on war service, cars are not run continuously for such a length of time that the oil supply is liable to become exhausted. On some of the Italian cars the oil-pressure indicator was a danger, for owing to partial choking of the filter on the oil line a high pressure might be recorded while very little oil was getting through to the bearings.

#### Oil Filter Essential

A filter on the oil line is very essential for war work, owing to the poor quality of oil usually supplied and the amount of foreign matter likely to get into it accidentally. Fiat has a very good filter, mounted just behind No. 4 cylinder, and consisting of an outer coarse and an inner fine gauze. The objection that may be brought against it is its inaccessibility, it being necessary to remove the floorboards, which are screwed down, in order to take it out. It is certain that unless very efficient management prevails, filters in the base chamber and around the pump will not be removed for cleaning. Several burned-out bearings have been traced to choked filters.

Besides being in an inconvenient position, the oil pump and filter were frequently difficult to dismantle. The



The type of steel disk wheel which has proved very efficient

pump drive consists of a spring which fits in slots in the pump spindle and in the skew drive from the camshaft. The spring is difficult to erect, as the casing around it does not form a guide. It was found that the most practical way to erect this was to stick the spring into position in the top slot, with thick grease, and then carefully enter the pump into position. In some cases these springs were incorrectly assembled, with the result that on starting they would not only fail to drive the pump but the spring itself would break. This arrangement is unsatisfactory in a workshop; it is not a job to be undertaken lightly when there is no cover for the car and the ground has been plowed up until it is several inches in mud.

If designers and manufacturers thoroughly understood war conditions they would make provision for the carrying of spare oil in such a position that it would be kept warm from the heat of the motor, could be readily passed into the base chamber, and small quantities drawn off as required. No car was encountered on the Italian front in which this was done in a really satisfactory manner. On many cars it would be an easy matter to have a reserve oil tank on the front face of the dashboard, with an oil lead direct to the filler and breather. This ought to be designed with the car and not put on later.

#### Block Casting for Engines

The writer is decidedly in favor of block casting for all, but especially for big motors. The difficulty of entering four pistons at one operation is more imaginary than real, for although there may not always be much tackling in the workshops at the front, there is always plenty of labor. It is important, however, that the mouth of the cylinders be tapered to give an easy entrance for the pistons.

Thermo-siphon cooling has not proved a success on war service. All Fords going into service in Italy have a special big-capacity V radiator, yet it was impossible to take these cars over many of the lower passes in summer without the water boiling away. The only thermo-siphon car encountered on this front which gave satisfactory service under strenuous conditions was a Metalurgique touring chassis converted into an ambulance. This car did not have a fan other than the flywheel. A Crossley, similarly converted, could never be kept cool on mountain roads even with the aid of a fan. Renaults kept sufficiently cool under normal roads but lost water on heavy climbs. English Daimlers with pump gave trouble with overheating in the mountains. Generally, English cars were inadequately cooled for mountain work. The motor on an American truck was rather overcooled. During the hottest portion of the summer, on the plains at the head of the Adriatic, it was rarely that the temperature of the water rose higher than a good average, while at night time they were running too cold, as shown by the Boyce Moto-Meter. Others, on the other hand, were inclined to run too hot, and although the writer found from experience that the water need not boil even under strenuous conditions, the margin was so small that many drivers of lesser experience could not get over the hills without adding more water. The Fiats showed very careful designing in the matter of engine cooling, for with fan properly working it was im-



A Ford on a mountain pass within rifle fire of the enemy trenches

possible to make them overheat under any circumstances. With the fan belt off they would overheat in a quarter of an hour on level roads. These remarks refer to the models with belt-driven and not with flywheel fan.

Considering the conditions, very little radiator trouble developed. On a few makes too rigid a mounting was adopted, with the result that the radiator was strained, and leaked after working on very rough roads. This straining was traced in several cases to the tie rod from the dash to the top of the radiator; with this rod removed, the radiator carried in trunnions, and a very flexible rubber connection from the top of the cylinders to the header tank, all trouble was avoided. The later Fiats had an exceedingly flexible mounting, for the trunnion bearings were rubber lined and the rubber connection to the cylinder outlet pipe allowed the top of the radiator to be moved at least half an inch. It is doubtless due to careful design in this respect that so little radiator trouble developed on this make.

#### Finned-Tube Radiators Predominate

Cellular radiators are entirely out of favor on the Italian front, the great majority of cars and trucks having the finned-tube type. The Gallay radiator, however, used by Lancia, gave very efficient service. In a large number of cases the finned-tube radiators were fitted with a false front to give them the appearance of a cellular type. This is done by Fiat, who has the false front for the touring models and finned tubes without disguise for trucks. Trouble developed in several cases by reason of the front edge of the motor hood rubbing on the radiator until a hole developed. This was particularly the case with a very flexibly mounted radiator; the remedy, of course, is simple.

Both V-section and flat fan belts were used, but neither showed any great preference. The uniting of the fan-blade tips by a ring was sometimes disadvantageous, for it prevented the belt being put on after it was sewn or riveted. In these cases the belt had to be riveted while around the pulley. There is very much in favor of the Spa practice of mounting the water pump in the cylinder casting and driving pump and fan from one shaft, without the use of a belt. It would be a very easy matter to incorporate a clutch with the fan drive, thus allowing the fan to be put into or out of motion as desired. Not enough attention was always paid to complete drainage of radiator and waterjacket. So far as the former is concerned, the best arrangement observed

was a V-section sump, with a tap in its base, at least a couple of inches below the bottom of the radiator. On some makes there was no drain on the pump housing, with the result that water lodged there, froze, and caused the pump drive to shear.

#### Accessories Demanded by War Conditions

On much of the work at the front drivers are never aware whether they are leaving their cars for a few hours or for the whole of the night; thus it is desirable to keep the water in the radiator as long as possible. This can only be done if a complete tight-fitting cover is provided for both radiator and hood. Drivers were not long in devising these covers themselves; but some makers now supply them with the car. Another useful accessory is a safety kerosene lamp to place under the hood when the car has to stand in the open for several hours.

War service does not bring forth any very strong claim for variable cooling, but it does show that the most strenuous conditions have not always been anticipated, with the result that there is a rather general tendency toward overheating under the most severe conditions, and also a tendency for the lower portion of the radiator to freeze on winter service over some of the Alpine passes. A thermostat is a rather delicate instrument to fit on a war-service truck. A more general practice, in Europe at any rate, is to get carbureters which will work under a wide range of temperatures. Aeroplane experience has shown that this can be done. Motors are required to operate at 50 deg. Cent., and, a few minutes later, after a rapid gliding descent, to pick up instantly and develop full power with the cooling water at only 5 or 6 deg. It is found better to get a carbureter capable of doing this than to fit variable cooling. This should be possible on truck work, where the rate of cooling is much less rapid. It would be an advantage, however, to provide shutters for the radiators, these shutters to work from the bottom upward, so as to allow protection to be given to a required area of the cooling surface.

#### Two-Part Mudpan

This naturally leads to the question of underpans. It is a rather common Italian practice to use two underpans, the forward one protecting the motor and ending only an inch or so behind the flywheel, and the second one being under the gearbox and upswept at the front to allow a free exit of air from the motor housing. This arrangement is not satisfactory—it is decidedly unsatisfactory with flywheel fans—for while the hot air from

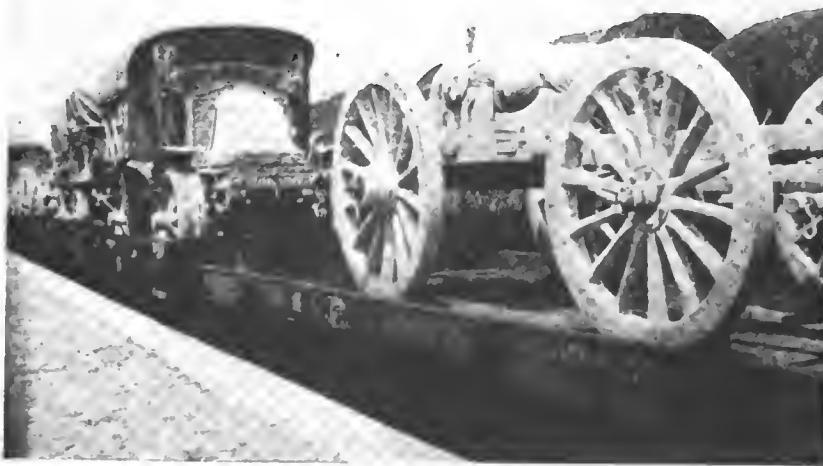
the engine is got rid of with the least obstruction, under very muddy road conditions an immense amount of dirt is flung up, caught by the flywheel and scattered in every direction. It is not uncommon, under certain road conditions, for cars to be stopped from this cause alone. The most practical arrangement is for the mudpan to be in two parts, overlapping and extending from the radiator to behind the gearbox. The best arrangement is an attachment by spring-controlled bolts, the pan being attached not to the frame members but to horizontal sheet-metal guards either screwed or riveted to the frame members. With this design, one side of the pan can be lowered as easily as opening a door, and the whole pan can be taken down or replaced by one man in a minimum of time. It is rather surprising that at this day so many underpans cannot be dismantled or replaced except by a couple of men and at least an hour's labor.

#### External Manifolds Save Cylinders

Some trouble was experienced with cars having integrally cast exhaust manifold. There were some cases of broken cylinders owing to excessive overheating at the exhaust manifold, which trouble was entirely avoided when the manifold was external. With a straight length of manifold there was the same valve accessibility as if it were cast with the cylinders. The big Fiat tractors suffered somewhat from the restricted size of the exhaust manifold and pipe. It was not at all uncommon to meet these tractors at night time, hauling heavy guns, with the whole of the exhaust pipe and muffler glowing red. The same applied to the Soler single-cylinder, two-piston tractor. It is certain that this defect did not reveal itself under peace conditions.

Shims for connecting-rod bearings gave a lot of trouble. It was the practice on some engines to set the bearings up as tight as possible, but after a very short time the shims would hammer into the white metal, for there was not a phosphor-bronze backing the whole length of the bearings, and the bearing would become loose. In some of the repairshops so much annoyance was experienced that a new phosphor-bronze shell was turned up and the bearing set up without shims, as is the general European practice. No shims are used on Italian vehicles, and their presence on American motors always met with the disapproval of the mechanical staffs. There were numbers of cases of melted connecting-rod bearings provoked by this looseness, for which the shims were primarily responsible. With this exception, the bearings were well proportioned on American motors. Main bearings gave little trouble. The few cases of failure which were reported were the center-bearing, the supply of oil to this bearing being somewhat limited for strenuous service. The same trouble was experienced on some of the European cars, and was overcome by increasing the supply of oil at this point. Forced feed to the main bearings is certainly to be recommended in preference to merely circulating systems; no trouble was experienced with troughs for connecting-rod bearings, however.

For ignition purposes the entire Italian army makes use of high-tension magneto without any batteries either as an auxiliary or for ease in starting. The Delco system found a place on the Buicks only. It proved itself very satisfactory. A starter on an army vehicle appears to be an altogether unnecessary refinement. Regulations call



Renault four-wheel drive tractors with the guns they usually haul being moved to a distant part of the front on flat cars



Automobile drivers' home at the front. The house is within sight of the enemy, but rooms being dry it forms very desirable quarters

for two men on every car at the front, and as they are both supposed to be capable drivers, and are dressed and equipped for their work, it is no hardship to get onto the road and crank a motor. There are half a dozen conveniences most army drivers would ask for in preference to a mechanical starter.

#### Accessibility of Parts Essential

American magnetos, on the whole, gave more trouble than battery ignition sets. For the first 6 months they were trouble proof; after that they gave endless trouble. Construction generally was poor, the machines demagnetizing, platinum contacts wearing out, and screws coming loose. It was not at all an unusual thing to take some magnetos out of the chassis four times a week to true up the platinum contacts.

Right here it is necessary to mention the greatest fault found with a motor having the pump and magneto set alongside it, the contact-breaker box facing toward the rear. By pulling out the floorboards, a contortionist might be able to see the contact points, but he could not adjust them while the magneto was in the chassis. To dismount, it is necessary to unscrew four studs passing through the magneto platform into the magneto base (two were really quite sufficient). A mechanic with a small hand and a correctly shaped wrench could get these studs out without disturbing the underpan. A heavy-fisted man had to take the pan down, and might be anything from 1 to 3 hr. on a job which ought not to have occupied more than a few minutes. The job could have been very much simplified by using a flexible band fastening for the magneto; better still, the pump and magneto could have been driven off a cross shaft, with the contact-breaker box pointing outward and above the level of the frame members, thus making adjustment a very simple matter and capable of being performed without taking the magneto off the motor. The writer had in his charge for 4 months a Berling magneto on a Fiat motor; it gave no trouble at all, and was running very satisfactorily when the car was turned over to another person.

For trucks with magneto ignition only, and these constitute the great majority of the Italian fleet, variable advance is to be preferred; but the amount of advance obtainable should be just sufficient to allow full advance to be given and maintained when the motor has warmed up and is in good condition. As all driving is done

with the accelerator pedal, there is no necessity, on army work, for throttle control on the steering wheel. All that is required is an easily operated minimum running adjustment either on the carbureter itself or on the dash, for it is not often that a cold motor will start on the minimum gas required to keep it running when once warmed. The abolition of the throttle lever is one little step toward simplification. One technical report which dealt largely with American chassis used on ambulance service in Italy suggested an additional air control so as to allow pure air to be aspired when descending long hills. This is, no doubt, useful in the hands of a good driver, but the real reason for the proposal was that the brakes on these cars were not efficient. The correct remedy would have been to improve the brakes.

Practically all Italian cars and trucks are fitted with pressure-feed gasoline, the pressure being taken from the exhaust, or in some cases obtained from an air pump. The system is very unsatisfactory. Gravity would be better, but it was not always an easy matter to locate the tank in a high position to give a flow on hills. Certainly the vacuum feed would have been a great improvement. Where exhaust pressure was used trouble was experienced in sooting and choking of the pressure valve, also by reason of the condensation of water in the manifold, this water being passed through the air line into the tank. In one set of Fiat cars, with pressure-fed tank under the seat, and gasoline supply drawn from the base of the tank, endless trouble was experienced with water. Within an hour of everything, including tank, being taken down, cleaned and dried, water would be found in the carbureter. This was inevitable, for condensation from the manifold caused the water to travel to the tank, and it came out at the lowest point and went to the carbureter. It could have been cured by bringing the outlet pipe through the top of the tank instead of the base, using this old outlet as a water drain-off. But as no copper pipe was immediately available at the front, the connection to the manifold was broken and pressure put on the tank by means of an ordinary tire pump mounted vertically by the driver's side. A single stroke of the pump about every half hour was quite sufficient to maintain pressure.

#### Tire Pumps to Increase Fuel Pressure

It was often found that the auxiliary hand pump on the dash was quite insufficient to maintain pressure if the exhaust pressure or air pump failed. Thus quite a number of drivers fitted up a tire pump on the dash and got all the pressure they required in two or three strokes. It is important that there should be a cock on the gasoline line just back of the carbureter, so that it is not necessary to crawl under the car to stop the flow if the line has to be broken. On one of the Fiats mentioned above as giving trouble owing to condensation and water in the carbureter, there was no such tap. Thus, with the tank under the seat, and gravity flow while on the level, it was necessary to crawl under to shut off the flow. One incident in this connection may be mentioned. The driver was crossing a partially wrecked bridge, under shell fire, when the carbureter choked owing to the presence of water. The driver, who was alone, had first of all to get under the car, then take down the gasoline line, clean out the filter and jet, and, after assembling, to again crawl under the car. The automobile was in view of the enemy all the time, shells were falling around, and other drivers, who had no desire to loiter at such a spot, were not complimentary to the man who had partially blocked the bridge. It is not necessary to repeat what the driver said about the designer of that feature on the car. (To be continued)

# Best Gasoline Exported

## British War-time Fuel Much Superior to Average on American Market

By A. Ludlow Clayden

AT the hearing held by the Bureau of Standards and the Bureau of Mines, in Washington, Jan. 25 and 26, where the representatives of the oil industry met with those of the government to discuss the fuel situation, it was once or twice asked just what sort of fuel is now being exported, and no very definite answer was forthcoming. In a recent issue of *The Motor*, London, the chart shown herewith was given, this having been plotted from tests made by a well-known chemist from samples of the best-known brands of gasoline now on the market in England.

Since the war, or rather since restrictions on the consumption of fuel, a number of fuels have been put out as "substitutes." These are cheaper than gasoline, and are supposed not to be quite so good, but they are distinctly lighter than kerosene. To explain names on this chart, it has always been the practice in England to sell gasoline in sealed 2-gal. cans, and it has always been sold under a brand. The Anglo-American Oil Co., which is a branch of, or in some way connected with, the Standard Oil Co., has one series of brands; the Shell Transport Co., whose source of supply is the Java and Sumatra fields, has another series. There are various independent makers. Mex, the writer believes to be a Russian or Roumanian oil; Carless has always been the highest grade fuel, and more expensive than any other kind. As a matter of fact, for a good many years past, even before the war, there were only a few places where it was possible to purchase Carless.

The accompanying chart from *The Motor* covers nearly all the important brands, because, although there are more than those shown, it is explained that the range for the commercial fuels lies between the limits of Pratt I and Carbus.

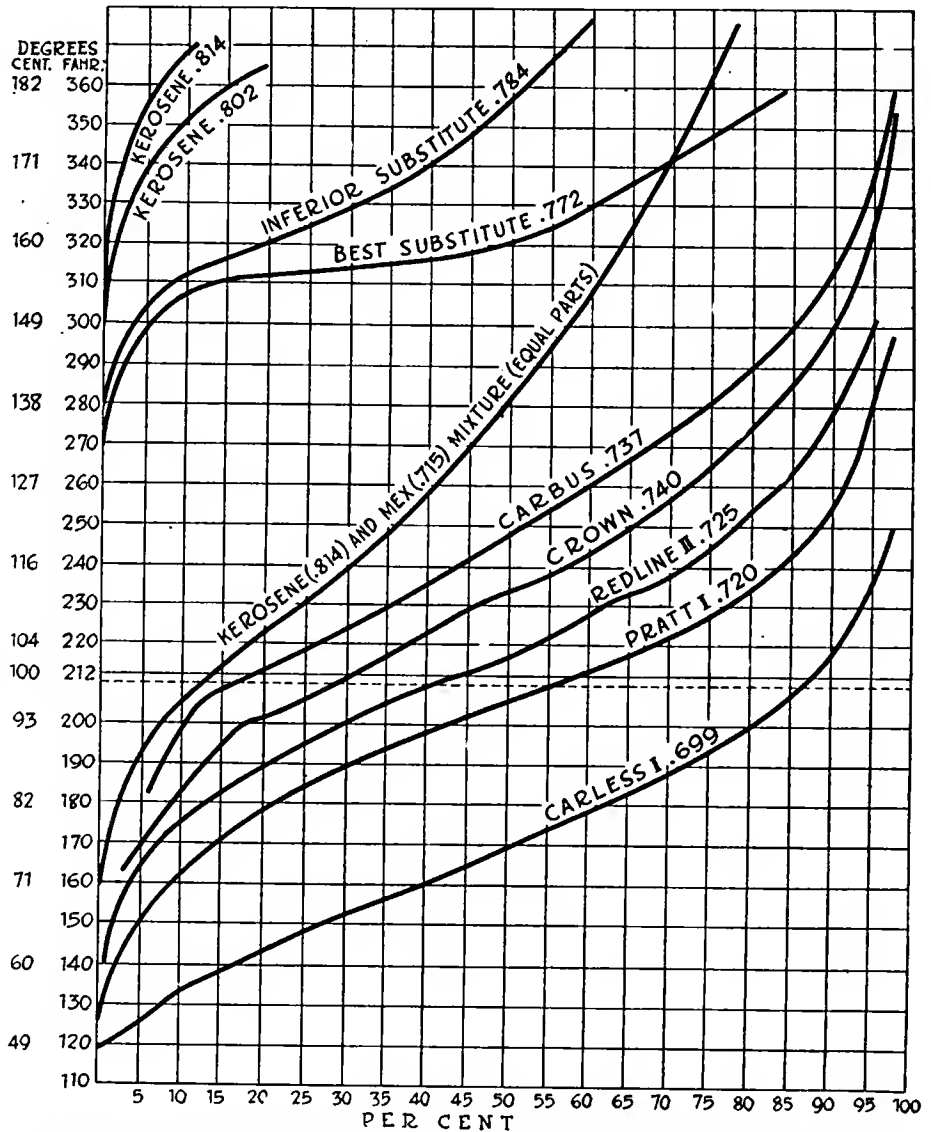
Taking Carbus as being heaviest, we note that its starting point is around 180 deg. Fahr. and the 98 per cent point, which is practically the same as the end point, 360 deg. Redline II, which is probably as fair an example of an average British fuel as one could obtain, has a starting point of 140 deg. Fahr., and presumably an end point of about 320.

These starting points compare more or less equally with the American gasolines, but it is doubtful whether many fuels to be bought on the open market this side of the Atlantic have an end point below 400; and it is a well-known fact that many

commercial gasolines have an end point of 450 or higher. The curve on this page marked as a mixture of Mex with kerosene, is much more like an ordinary American gasoline.

### Preserving Car Finish on Driveaways

To PRESERVE the body finish while driving cars from factory to salesroom J. C. Kardell, vice-president of the Kardell Motor Car Co., St. Louis, recommends the application of a liberal coating of olive oil before starting and washing the car promptly after its arrival. The Kardell company recently drove a number of Reo cars direct from the factory in Lansing, Mich., to its salesrooms in St. Louis, in this manner and found this treatment of the bodies very successful.



Volatility of automobile fuels—For all practical purposes the curve for Pratt I also represents Carburine I, the curve Redline II represents Carburine II, Mex, Redline I and Shell I; similarly the curve for Crown represents Shell II, Pratt II, Carburine III, and Taxibus

# Holley Kerosene Vaporizer Ready

Manufacture on a Large Scale To Be Undertaken at Once—Type for Ford Model T Cars Described in Detail, Including Its Installation and Operation

**H**OLLEY BROS.' kerosene vaporizer, which has been under development for some time in this country and of which a large number have been shipped abroad, is now ready for the American market. Representatives of THE AUTOMOBILE have been given the first opportunity to view the new Holley instrument on test and in operation, and the Holley Bros. Co. is ready to begin the manufacture of this unit on a large scale.

It has been recognized for some time that we have either to come to two fuels—kerosene and gasoline—or else take a straight-cut product which will be far more closer to the characteristics of present-day kerosene than those of gasoline. Therefore, the development of successful kerosene vaporizers does not necessarily mean that we shall have both kerosene and gasoline, but is far more significant because of the ability to use lower grades of fuel successfully. The Holley carbureter will use kerosene distillate, benzole, gasoline, or any hydrocarbon, with final boiling point below 600 deg.

The Holley vaporizer model 212 is especially adapted to Ford model T cars. It is designed to start on gasoline and after 1 or 2 min. running to operate on kerosene. The primary principle of the use of kerosene in the Holley instrument is the pre-heating by the exhaust temperature of an extremely rich mixture of kerosene and air, which is subsequently leaned out by the addition of auxiliary cold air. The Ford model sells for \$22 complete, \$3 being allowed for parts removed from the car.

Referring to the accompanying illustration, which shows a section of the new instrument, kerosene and gasoline enter their respective float chambers through ordinary float valve mechanisms. From the float chambers, either fuel, depending upon the position of the shifter valve *V*, passes through the adjusting needle valve *N*, and through a jet *J*, at the top of which it is atomized by an air blast induced by the suction of the motor, the air entering at *A1*. This is really an aspirating tube, but it has such a small area that the quantity of air admitted is only a small fraction of that required for combustion. This produces an exceedingly rich mixture.

This rich mixture of atomized fuel with the primary air is carried upward through a vaporizing tube *T* seated in the exhaust manifold. It will be noted that this tube is coiled so as to absorb the maximum amount of heat from the exhaust, the temperature reaching 500 deg. Fahr.

From this coil the rich mixture is led directly to the mixing chamber through the stuffing box *B*, where additional air is taken in through the air valve *A2*, which puts the mixture into

its proper condition for combustion. The opening of the air valve in the mixing chamber is governed by the suction of the motor and by the opening of the throttle valve. From the mixing chamber the mixture in correct proportions is drawn into the engine cylinders through the inlet manifold in the usual way.

In order to successfully handle the kerosene it is necessary to use a slightly lower compression than that employed in the standard Ford engine. This reduction in compression is accomplished by substituting a low compression head on the cylinders, which brings the compression from about 60 per sq. in. gage down to about 48 per sq. in. gage. It is possible with the kerosene outfit to secure a maximum speed of about 40 m.p.h., and on the testing dynamometer the maximum horsepower is about 20 per cent less than with gasoline. As regards performance, however, this difference is not noticeable commercially. A test witnessed by a representative of THE AUTOMOBILE showed a Ford car operating successfully at 6 m.p.h. with excellent acceleration upon opening the throttle from this speed on high gear.

Directions for the application of this instrument to the Ford T car and for the operation of the Ford car when so equipped are as follows:

To apply the Holley model 212 vaporizer to Ford model T cars with left hand drive, proceed as follows:

Attach the complete assembly to the motor, using standard gaskets, collars and clamps for this purpose. Be sure the connection of the vapor tube *T* to the mixing chamber is not loosened, as it is necessary to maintain a gastight joint at this point.

Replace regular exhaust pipe with longer one with special bends to attach to connector *C*, using a standard Ford clamp nut for this purpose.

Replace standard cylinder head with the special low compression head, using specially furnished long cap screws.

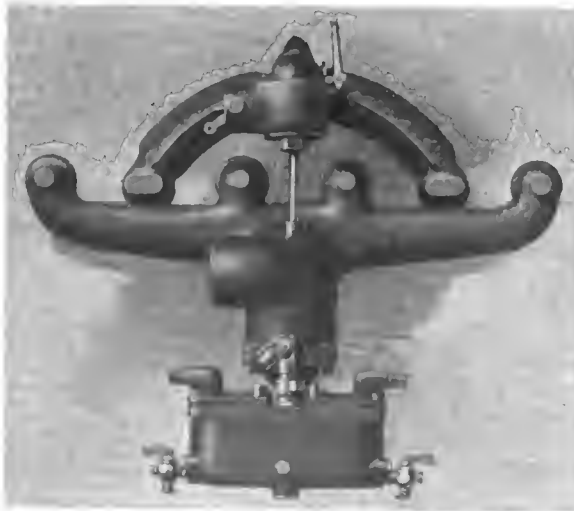
Replace the standard gasoline tank with special two-compartment tank to carry the main supply of kerosene and a small quantity of gasoline for starting purposes.

Connect the two fuel tanks to their respective float chambers, using standard Ford connecting nuts and special lengths of tubing.

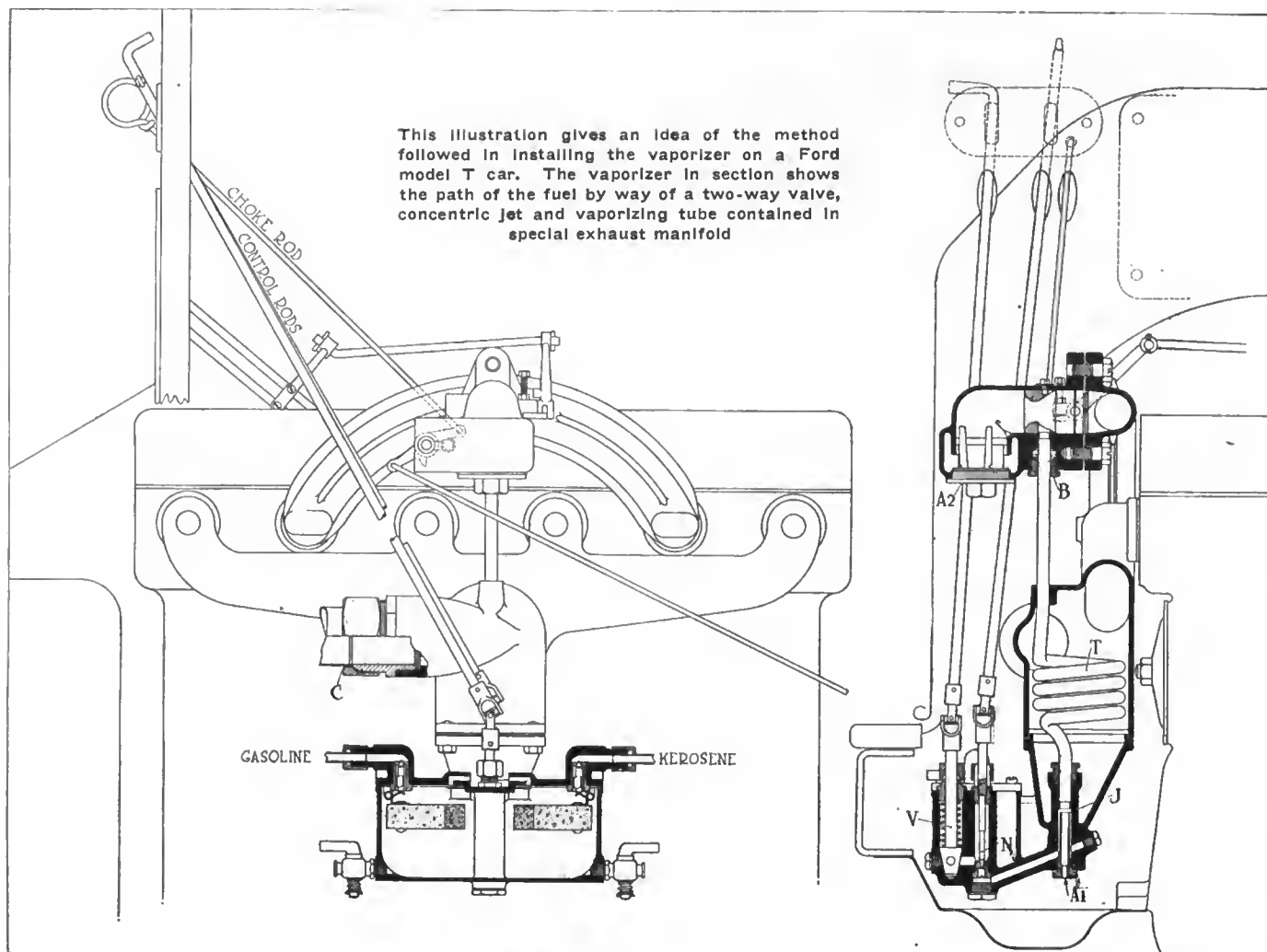
Attach dash-plate so that hole for the air shutter wire is just above the lower edge of the original adjusting rod hole in the dashboard.

Use the plate in this position as template for drilling two holes in dash for control rods, as illustrated.

Pass fuel adjusting rod and shifter valve rod through these new holes in the dash and connect them to their respective universal joints by pinning them in place with the small split cotterpins furnished for this purpose. Be sure that the ends of the coppers are bent over so they cannot interfere.



Exterior view of the Holley kerosene vaporizer for Ford cars, showing the manifold construction for pre-heating the mixture



The handle of the two-way valve rod must point toward the word Gas when the stop lever on the shifter valve is against the forward stop screw.

Place the throttle rod on throttle lever and make necessary adjustments by means of location of lever to allow throttle to open and close properly.

Pass choke wire through the hole in the dash plate and connect it to the upper end of the intake shutter lever so that with the shutter open, the wire handle clears the dash plate by about 1/4 in.

Pass the priming wire through the hole below the right hand side of the radiator and connect to lower end of intake shutter lever, leaving the handle clear of the radiator by about 1/4 in.

**Operation of Holley Vaporizer**

Fill small section of fuel tank with gasoline and large section with kerosene.

Turn two-way cock handle to gasoline position, close the needle valve N by means of handle, and then open this valve 1 1/2 to 1 3/4 turns.

Open shut-off valves in both fuel lines.

Move throttle control lever 2 or 3 notches from the closed position.

Set spark lever in usual place for cranking.

Turn ignition switch to "On" position.

Crank motor, at the same time closing intake shutter by pulling priming wire. This operation is the same as when starting the motor with an ordinary gasoline carbureter.

After the motor has run 1 to 3 min. on gasoline, turn the two-way cock handle to kerosene position. If, after an interval of a few seconds, motor tends to decrease speed and stop, pull and release instantly, priming wire projecting through the radiator, or choke wire projecting through dash; i. e., close the air intake shutter momentarily. The motor should then run satisfactorily on kerosene.

Adjust throttle stop setscrew so that motor runs at proper idling speed when hand throttle control lever is in closed position.

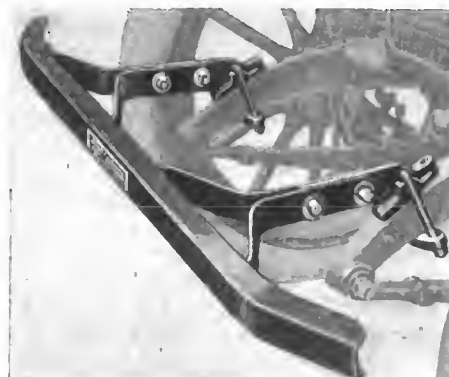
Adjust needle valve by handle as the same adjustment would be made for the standard gasoline carbureter.

**Stewart-Warner Adds Bumper**

CHICAGO, April 30—The Stewart-Warner Speedometer Corp. has added a bumper to its list of accessories. The new product is called the Autoguard. It is simple in design and contains only five prime parts in its construction—the guard or channel bar, two springs, and two heads or frame connections. The shock-absorbing members consist of full elliptic springs, which may be adjusted to fit various widths of frames without making it necessary to drill holes in the channel.

The frame brackets, or attaching members, are universal and fit practically any make of car. Provision is made for automatic adjustment by means of hook ends on the bolts.

Stewart Auto-guard, recently added to the list of products manufactured by the Stewart-Warner Speedometer Corp., Chicago





# Detroit Purchasing Agents Join National Body

Organize Branch of National Assn. of Purchasing Agents  
—Movement Promoted by THE AUTOMOBILE—Big  
Car, Truck, Parts and Accessory Makers Represented

By J. Edward Schipper

**D**ETROIT, April 27.—Several leading purchasing agents of the Detroit automobile and parts factories have formed a local branch of the National Assn. of Purchasing Agents, the local branch being for the general benefit of purchasing departments and to develop co-operation among purchasing agents, the same as has been done in salesmanship and engineering. Last night's organization meeting at the Detroit Athletic Club afforded a good opportunity to air many of the abuses to which the purchasing field is a victim, and suggested plans how these abuses might be corrected.

The National Assn. of Purchasing Agents, which is now in its infancy, has six local associations, Baltimore and Syracuse having recently been added. Detroit is the latest recruit. The association will hold a convention at Pittsburgh Sept. 25 to 28.

While little has been said regarding organization among purchasing agents, it has become generally understood that many factors in the purchasing-agent field have made co-operation with some national association necessary. The standardized catalog has been advocated as one of the activities of such an organization. To-day the multiplicity of varied sizes of catalogs, many without specific information, has worked an injury rather than a benefit. The purchasing agent is subject to numerous abuses, among which might be mentioned the unfair list, made up of names representing sources of supply known by purchasing agents to be constantly giving trouble. Such a list could be posted. It would represent co-ordinated knowledge of all the members of the association, and would be a factor for better business.

What has been done by various other national associations can unquestionably be accomplished by the National Assn. of Purchasing Agents, and it is this thought that spurred many of the Detroit purchasing agents to co-operate in the establishment of a branch of the national organization.

#### Woodruff to Be Chairman

At the meeting last night a temporary governing board was appointed, of which C. A. Woodruff, director of purchases of the Chalmers Motor Car Co., and a director of the National Assn. of Purchasing Agents, is chairman. The other members of the governing board are all purchasing agents of prominent local concerns. They are: J. H. Main, Cadillac Motor Car Co.; F. H. Maisenville, Timken-Detroit Axle Co.; H. H. Viot, Continental Motor Corp.; Geo. Berringer, Parke, Davis & Co., drug manufacturers; T. F. Thornton, Detroit Steel Products Co.;

and H. Hawk of the Willys-Overland Co., Toledo, Ohio.

These are leading concerns, and the attendance list at the meeting last night showed that the representation was of the highest caliber. Two members of the national association, W. L. Chandler, who is back of the movement for the master catalog, and E. T. Wolfe of the South Bend branch, and a director in the national body, were present. They described the work of the national association and showed the importance of the work.

The germ of the Detroit branch was sown at a recent meeting called in this city by THE AUTOMOBILE, in which the purchasing agents stated their views on the factors governing conditions in the market situation. It was recognized that a local organization of the purchasing executives could not fail to be of value. Inquiry disclosed the fact that the national organization was eager to have a branch in this industrial center. Realizing the bigness of the work to be done, the financing and promotion of the preliminary organization have been carried on by the editorial office of THE AUTOMOBILE, and now that the organization is complete the branch has been turned over to the committee named

above, which is composed of men familiar by years of experience with the problems in the buying field. It is expected that 250 to 300 local members will soon unite with the new organization.

In all probabilities the auditorium of the Detroit Board of Commerce can be secured for meetings. Last night's meeting was addressed by W. L. Chandler and E. T. Wolfe, of the national organization, and C. A. Woodruff, chairman-elect of the Detroit branch.

W. L. Chandler, Dodge Sales & Engineering Co., Mishawaka, Ind., dwelt on the fact that, while a large part of the purchasing agent's work must of necessity be independent, organization permits of concerted movements toward improvement of methods and conditions in this work and the elimination of illegitimate and otherwise undesirable factors. Mr. Dodge advocated bureaus for testing materials, securing information, etc., and mentioned the master catalog as soon to be a reality. His address, in part, follows:

#### Buyers en Masse

"Wolves hunt in packs; they do not roam by themselves in quest of their requirements. Great numbers operate as one organized unit in any enterprise affecting the common interest. They are said to be collectivistic.

"On the other hand, the cat is individualistic. Instead of hunting in groups of any sort, the cat hunts alone.

### Organization Benefits

Co-operation in Buying  
Direct Purchasing  
Materials Standards  
Master Catalog  
Standardized Catalogs  
Unfair List Posted  
Bad Business Curbed  
Legislation Improved  
Higher Code of Ethics  
Lower Operating Expense  
Better Buying Methods  
Closer Factory Relations

In fact, I know of no name such as pack, herd, covey or flock being applicable to cats.

"Now, a full-blooded, dyed-in-the-wool, born-for-the-job purchasing agent is necessarily of the individualistic type. He must think for himself and act independently of the rest according to his particular requirements.

"He may listen to the 'scientific salesman,' so-called, but must form his own opinion and sign on the dotted line only when his calm judgment tells him that the transaction is sound from his standpoint, regardless of the fact that every other buyer in his line may be represented as having bought the article in question.

"However, by insisting upon playing the game alone, he loses the great values that might be secured by co-operation. In order that he may reap the fullest harvest he should emulate the cat when such a course 'is indicated,' as the doctors express it, and then when he needs the tremendous power which comes with united effort he must follow the practice of the wolves and join the pack.

"In other words, he must emulate the Jekyll and Hyde plan, changing from one type to the other as occasion requires.

**More to Business Than Selling**

"During the last few years, big-business men have discovered that there is more to business than mere selling. Formerly the salesmen, through organized efforts, à la wolf, had convinced the general managers that every other problem of business was secondary to that of selling. There was enough sound logic behind their contentions to enable them to carry the pendulum much beyond the center.

"Many manufacturers are compelled through competition to sell their wares to the dealer and then perform the further function, with all its expense burden, of moving the goods off the dealer's shelves in order to get the big turn-over required to meet the sales quota and to increase consumption.

"In some cases the large turn-over thus obtained is justified in the light of lower proportionate overhead costs secured.

"However, much of the selling expense incurred to-day is a huge economic waste and is becoming such a burden that it must be recognized as such and proper remedies applied.

"During the last year about the only articles of value kicking around loose were orders. The only task for salesmen was to ascertain exactly what was wanted and to get the price high enough to cover the demands of the situation.

"The biggest problem of business to-day is to find material and men to produce the goods to fill orders. Two new sciences are being developed now as the pendulum begins its swing back toward normal. The sciences of buymanship and employmentship are receiving their proper consideration. A successful manufacturing enterprise depends upon:

- Ample capital.
- A product correctly planned.
- A plant designed to manufacture it efficiently.
- The right raw material at the right price.
- Efficient labor.
- Intelligent production methods.
- Safe credits.
- Adequate distribution.
- Prompt collections.

"Some years ago the situation in the financial world led to the formation of the National Assn. of Credit Men. That association now numbers over 21,000 men representing practically as many concerns all over the United States.

**Influence of Co-operation**

"Prior to its formation, each credit man had been struggling and floundering, à la cat, wishing and hoping for more sane business methods pertaining to his work. They, like the buyers, were instinctively of the individualistic type—but they awoke to the fact that as individuals they could do little worth while toward improving the ethics of their profession; toward the curtailing of the abuses of credit granting and most important of all, toward eliminating dishonest practices in business transactions.

"They have demonstrated that thousands of credit men co-operating can exert a very beneficial influence upon financial legislation such as bulk sales laws, the federal reserve act, and many other matters which have been instrumental in greatly advancing the ethical phase of their work.

*"They have reduced the cost of doing legitimate business by eliminating much illegitimate business.*

"Buyers must continue to exercise the same individual good judgment in deciding when and where to buy, but collectively they will now be heard and felt in developing the science of buymanship.

"They will soon begin to reap those greater benefits that can only result from co-operation—from the force of thousands of buyers all seeking the elimination of the false in business as it affects their work.

**Purchasing Agent an Executive**

"The purchasing agent will take his proper place among the real executives of a corporation just as soon as he develops his capacities and renders a service worthy of his job. Unaided he cannot reach anything like the advancement which is possible when his efforts are multiplied by the thousands represented by the buying power of this nation.

"Buyers must develop a code of ethics—must eliminate crooked deals and questionable practices which operate against honest buymanship—must teach the strict observance of sales terms; the non-abuse of cash discount privileges; the conservation of the time of real salesmen; and discourage the unnecessary entertainment of buyers.

"In turn, they can include in the code of ethics a proper respect for the relation between promises and deliveries; discourage the use of order takers who cost their employers nearly as much for salaries and expenses as do real, sure-enough salesmen, and yet who are of no value to business; teach against the use of fraudulent and wasteful or non-productive advertising, and influence legislation against fraudulent sales methods.

*"By co-operation, buyers may thus, like credit men, further reduce the cost of doing legitimate business by further eliminating illegitimate business.*

"They may take a hand in framing standard forms of buying contracts, sometimes called sales contracts, bringing them, through co-operation

**Why Organization?**

**An Example**

Unusual and interesting were many of the anecdotes related at the meeting. Following is one that well illustrates some of the troubles of the purchasing agent. It was told by F. H. Masonville of the Timken-Detroit Axle Co.

"A few weeks ago a salesman called on me at our plant and sent in a card listing a number of companies and showing that he sold everything from fishhooks to ship anchors.

"Are you in the market for malleables?" he asked.

"Yes," I replied. "What firm do you represent?"

"He scratched his head and answered, 'Well, I don't recall the name of the firm.'

"Where are they located?" I asked, hoping to help him out.

"Again he scratched his head. 'I think they are somewhere in Wisconsin.'

"Do they make railway malleables or motor car malleables? What kind of malleables do they make?" I asked.

"Exit salesman."

with selling interests, to a basis much more equitable than many in use to-day. The question of price control is another factor of business in which organized buyers may have a beneficial influence.

#### Testing Bureaus Encouraged

"Organized buyers may create or encourage bureaus for testing materials and bureaus of information from which may develop various standards for materials.

"For example: Consider the present standards used in the sale of lumber. These were established by salesmen. Will organized buyers suggest any changes in these standards? Coal has been sold without regard to the value to be derived by the consumer. Attempts are being made to buy coal on a basis of what is received for the money in the form of utilizable heat energy.

"However, coal operators frown upon anything which encroaches upon their sacred precinct. Big consumers of coal are the only ones able to make any headway against the opposition of the coal barons.

"Thousands of coal buyers, together with the coal salesmen, may agree upon an equitable basis of buying and selling coal so that each individual buyer may have the benefit of the strength of union.

"Other raw materials may be similarly influenced for good, and innumerable manufactured articles may be bought upon standardized specifications, provided there is some method of arriving at the proper specifications.

#### The Master Catalog

"Last, but not least, we are soon to have standardized catalogs. We all know the tremendous burden not only to buyers, but to business generally due to lack of uniformity in size, as well as arrangement in catalogs.

"Business men are everywhere striving to reach some standard for catalogs by which to eliminate much of the great waste of time and material now going on. Various organizations are struggling with the problem—each striving to solve the riddle from its own limited viewpoint.

"I am not wedded to any one form of catalog, but am convinced that commerce will never be fully served until all these various organizations which are struggling with this problem get together and lay their ideas and difficulties on the table where they may be studied by all and the best retained and adopted throughout the nation.

"My hope and belief is that when the smoke clears away each buyer will have but one catalog—his own—in which to find everything he buys.

#### Vertical Filing Cabinets

"I have previously suggested that vertical filing cabinets be utilized; also, that each industry, through its proper associations, prepare a portion of the index designed to enable buyers to intelligently file catalog data pertaining to that industry.

"Thus an index covering each commodity may be developed by those most familiar with its needs. The buyer, however, will use only such portions as bear upon his particular requirements.

"Divisions of the index may be numbered so that data bearing a proper number may be filed correctly by any average clerk. Arrangements can be made to guard against portions of such a catalog becoming obsolete by a method which has been explained in the trade press.

"Such a catalog may be limitless in size and scope. It may consist of any needed number of drawers. No restrictions need be placed upon quality of paper or printing except as dictated by the judgment of the seller.

"This catalog will have no influence on printed matter which now goes to the residences, or on matter not in-

tended for preservation, and will not discourage a limited use of catalogs of styles such as are now in vogue where buyers or sellers desire to continue them for especial reasons.

"Such a file will accommodate anything from a letter to a bound book, provided it is not larger than the size of the file. Practical solutions of many other details have been evolved, but time and space will not permit elaboration sufficient to cover all.

"We have considered briefly many advantages that will follow the development of nation-wide co-operation of the buying fraternity. One buyer alone is powerless to do anything big, one local association can accomplish very little more. One State association can do a little better, but it seems very evident that we shall never derive our full share of benefits except through a national, or, better still, an international association.

"Shall we wait until the policies of this organization are formed and fully crystallized, or shall we join now while it is in a formative state, and help to shape its policies and to direct its energies into channels which will most promptly and effectively bring to us the fullest measure of benefits.

*"Why not take our place in the sun now and have a worthy hand in the development of this most important association?"*

#### National Body Organized

E. T. Wolfe, purchasing agent of the Baker-Vawter Co., Benton Harbor, Mich., and director of the National Purchasing Agents' Association, stated that the association was founded in New York 2 years ago, with the following as its purpose of organization:

1. To form the purchasing agents, or buyers, into an organized body for the common good.
2. To promote the friendly exchange of ideas and opinions.
3. To form local associations.
4. To familiarize the buyers with various products and sources.
5. To discuss and form routine purchasing methods.
6. To create specific standards for the buyer.
7. To gather data.
8. To diffuse information.
9. To obtain special speakers, that are experts in their lines, to address the members.
10. To establish various bureaus of information.
11. Support of domestic industries.

These principles are fundamental, and chosen to elevate the buying profession, which in the past has not been recognized in its true importance. Possibly the buyer has not been recognized because his work does not show a profit on the books, but chiefly because he has worked alone, and not organized with others in the same business.

The growth of the organization was shown to have been sound. In none of the local organizations were members solicited, and thus the members joining did so because they believed that the association could do them good, and were willing to work to make their beliefs come true.

By this means potential men were obtained as members, and Mr. Wolfe emphasized the necessity of obtaining influential men for the organization. And the growth in the past 2 years has been sound, and not a sporadic outbreak that will taper off to nothingness.

The qualifications for membership in the association are that the applicant be a bona fide purchasing agent—a buyer, and not a seller. Certain exceptions are permissible, such as executives, these exceptions being de-

cided by the local branch, who are best situated to decide upon the advisability of admitting the applicant.

#### Method of Finance

The initiation fee of \$5 goes to the national association, and of the yearly dues of \$10, \$2.50 goes to the national association and the rest is kept by the branch. This is used for office expenses, entertainment and promotion work.

Though the convention is for the purchasing agents, the members were asked to invite the officials of their companies to the banquet, because by attending the officials will come to a better understanding of the benefits of the organization.

C. A. Woodruff, who was elected chairman of the temporary executive committee of the new organization, is well qualified to be chairman, having been a purchasing agent practically all his life. He was formerly with Armour & Co., Chicago, and then with the National Cash Register Co., as purchasing agent, before becoming associated with the Chalmers Motor Car Co., in a similar capacity. Mr. Woodruff is also director of the National Purchasing Agents' Assn.

#### Buyer and Seller Contrasted

Mr. Woodruff stated that the purchasing agent was of necessity the diametrical opposite of the salesman. He must of necessity be from Missouri, and of an analytical nature. Where the one is affable, enthusiastic, the other must consider and compare, neglecting if possible personality and favor.

Another condition that Woodruff suggested might be

corrected was that of dealing through a third party. This condition has become more serious during the war. Material sells itself, yet many needless branch selling organizations are prevalent. And the buyer has to pay a fancy commission on a high-priced item that is purchased without sales effort on the part of the branch salesman.

For example, many standard articles may best be purchased direct from the factory. The buyer, needing these articles, will ask for quotations from the factory, and hears nothing until the local agent, who has done nothing to produce the interest, create desire, and close the sale, comes in and takes the order. For this he receives a commission varying from 5 to 25 per cent, that must be added to the price of an already high-priced item.

#### Standard Catalog Favored

Woodruff outlined the benefits of a uniform catalog system. If catalogs were printed on one side of a sheet, the sheet could be filed in a suitable filing cabinet, indexed, and kept up to date. As it is, he stated, it would take a search warrant to find the desired catalog, and another to find the item desired.

Relations between the purchasing agent and the rest of the organization could also be bettered. Many executives do not realize that a sales contract is a contract, and cannot be broken at will—engineers do not realize that standards adapted, but not followed, are useless, and that items not standard are costly and not easy to procure.

It was moved that THE AUTOMOBILE be given a vote of thanks for the work done in promoting and organizing the association. The vote was unanimous.

## New Empire Four Improved in Appearance

Radiator Higher and Narrower, Windshield Slanting, Better Body Lines and New Top—Disk Clutch Replaces Cone

A NEW four-cylinder, five-passenger car, called model 50, has been brought out by the Empire Automobile Co., Indianapolis, to supplant its model 45. Because of improvements in body design and construction, refinements in the chassis and higher materials costs the price has been increased to \$1,125, from \$960, the price of the previous four-cylinder model 45.

The radiator of the new car is higher and narrower than that of its predecessor, presenting an increased cooling surface. The hood lines are higher and wider and the front cowl is raised, giving the car a smarter appearance. The windshield is now tilted, and the instrument board is of solid walnut. There are hand pads on all four doors. The center cowl is refined and there is a double-texture Neverleak cloth one-man top instead of the single-texture top used on the model 45. There is a new type of headlight.

In the chassis the Borg & Beck dry-disk clutch replaces the cone clutch formerly used. The new rear axle is of a different make, being semi-floating with a heavy yoke on the third member.

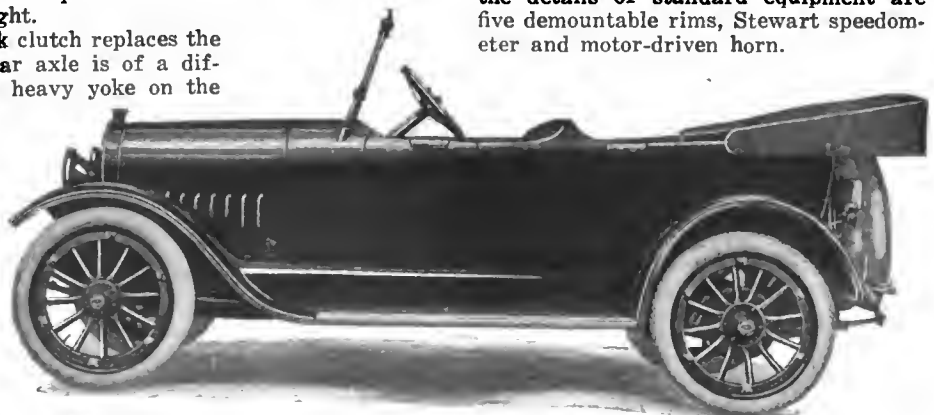
The Teetor-Hartley engine is continued with minor modifications. This is of T-head design, as previously, with a bore and stroke of  $3\frac{1}{8}$  by 5. It is said to deliver 40 hp. at 2000 r.p.m. Cylinders are block-cast with pistons of gray iron. The lubrication system is the Teetor patented splash type.

Ignition is furnished through a distributor from battery current and the switch is fitted with a key lock and the flow of current is automatically cut off when the engine is stopped.

A Stromberg carbureter is fastened to the cylinder block by means of a short spacer, the manifold chamber being within the cylinder block.

Two body finishes are optional on this touring car, a deep brown with brown Spanish leather upholstery and brown hood to match, or dark green with black long-grain leather upholstery. All fenders and running board splashers are black enameled.

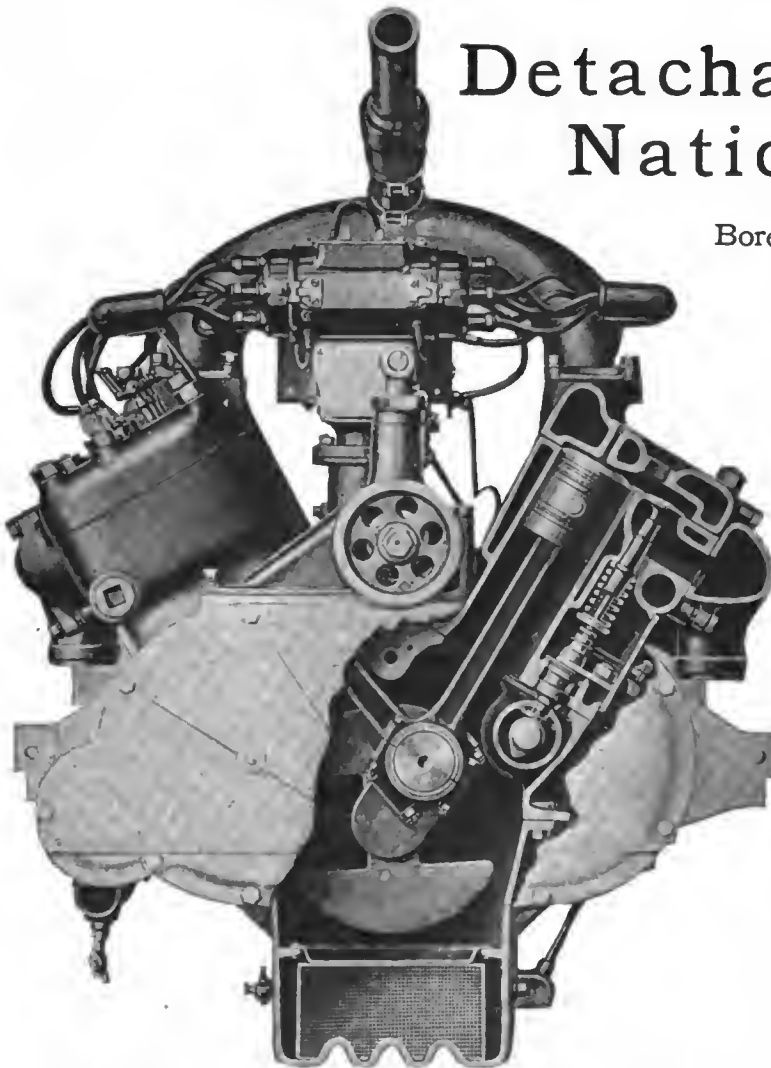
Starting and lighting are by the two-unit Empire Auto-Lite system, the storage battery being a three-cell, 6-volt, 80-amp. type. Tires are oversize, 33 by 4 in., with non-skid in the rear. Springs are of temperate steel and seat cushions are deep with the seat backs deeply tufted. The front cowl is deep and the doors have 20-in. clear openings. Among the details of standard equipment are five demountable rims, Stewart speedometer and motor-driven horn.



Empire four-cylinder model 50 five-passenger touring car which sells for \$1,125

# Detachable Heads for National Twelve

Bore Increased  $\frac{1}{8}$  In. — Crankshaft Counterweighted — New Intake System with "Hot Spot" for Vaporizing



Cross section of the new National twelve, showing the counterweighted crankshaft and the circular intake passage, which is kept hot owing to its proximity to the exhaust pockets

INTRODUCED for the first time early in 1915, the National twelve has undergone but little alteration in design. About 1000 of this type are in use at the present time. Now a new model is announced having all the principal features of the original twelve, but with a number of small alterations in the engine that give greatly increased power and, particularly, an even more noticeable high gear ability at low car speeds.

Taking the alterations briefly, they comprise an increase of bore from  $2\frac{3}{4}$  in. to  $2\frac{7}{8}$  in., the stroke remaining  $4\frac{1}{2}$  in. as before; a new intake system with a "hot spot"; a counterweighted crankshaft with larger bearings, and a detachable cylinder head. The oiling system is also improved and there are some other detail changes that will be mentioned in due course.

Not the least important of the changes is the use of the detachable head, because the even size of combustion chamber which this makes possible is of conspicuous advantage in obtaining perfectly regular running at idling speeds, where variations in the force of each explosion are most easily observed. This change in head design has not affected the layout of the engine in any way. The valves are still arranged L fashion and on the outside of the V, leaving the alley clear for the accommodation of the starting motor, the carburetor and the ignition unit. There are gear drives for the two camshafts and a silent chain for the ignition unit. The latter is new to the National, being now a double header Delco outfit; it is mounted at the front end of the cylinder alley and the shaft which operates it carries the fan pulley, this bringing the belt high up, where it is well protected from dirt and oil and therefore likely to have a maximum durability.

## Twelve-Cylinder Series AK

Formula horsepower, 39.68.  
 Piston displacement, 370.1 cu. in.  
 Gear ratio, 4 7/12 to 1.  
 Ignition, Delco.  
 Carburetor, Rayfield.  
 L. and S., Bijur.  
 Transmission gear ratios:  
 First speed, 2.77 to 1.  
 Second speed, 1.66 to 1.  
 Third speed, 1 to 1.  
 Reverse, 3.6 to 1.  
 Turning radius, 19.5 ft.  
 Road clearance, 10 in.  
 Tires, 34 x  $4\frac{1}{2}$ .  
 Twelve-cylinder,  $4\frac{1}{8}$  bore by  $4\frac{1}{2}$  stroke.  
 Compression ratio, 20%.  
 Length of connecting rod, 10 $\frac{1}{2}$  in. of drop forged steel.  
 Length of piston overall, 3  $\frac{11}{32}$  in. of cast iron.  
 Number of rings, 4.  
 Wristpin, tight in piston.  
 Upper connecting-rod bearing, 11/16 in. diameter by  $1\frac{1}{4}$  in. long.  
 Lower connecting-rod bearing, 2 in. diameter by  $2\frac{1}{2}$  in. long.  
 Crankshaft, drop forged with 4 counterweights electrically welded.  
 Crankshaft bearings:  
 Front bearing,  $2\frac{1}{8}$  in. diameter by  $3\frac{3}{4}$  in. long.  
 Center bearing,  $2\frac{3}{16}$  in. diameter by  $3\frac{1}{4}$  in. long.  
 Main bearing,  $2\frac{3}{16}$  in. diameter by  $3\frac{31}{32}$  in. long.  
 Camshafts, forged with minimum diameter of  $1\frac{1}{2}$  in., driven by spiral gears cast iron, 1 in. face.  
 Camshaft bearings into bronze bushings pressed into case:  
 Rear, length  $2\frac{7}{16}$  in., diameter 2 in.  
 Center,  $2\frac{1}{4}$  in., diameter 2 in.  
 Front,  $2\frac{3}{4}$  in., diameter 2 in.  
 Valve timing:  
 Exhaust open,  $43\frac{1}{2}^\circ$ ; closed,  $2^\circ 40'$ .  
 Inlet open,  $6^\circ$ ; closed,  $42^\circ$ .  
 Total opening period of exhaust valve,  $226^\circ$ .  
 Total opening period of inlet valve,  $216^\circ$ .  
 Valve spring pressure, 52 lb. when valve is seated.

The new intake system, designed to allow the engine to handle heavy grades of gasoline with satisfaction, divides into two parts, or rather three. The manifold which connects the two blocks of cylinders is water jacketed, forming the water outlet from the cylinders. Its temperature is a fairly constant quantity, as the thermostat is located in the pipe leading up to the radiator. Next come the two cored passages within the cylinders, these consisting of a cross passage leading from the inside to the outside of each block and a longitudinal passage from end to end of each block.

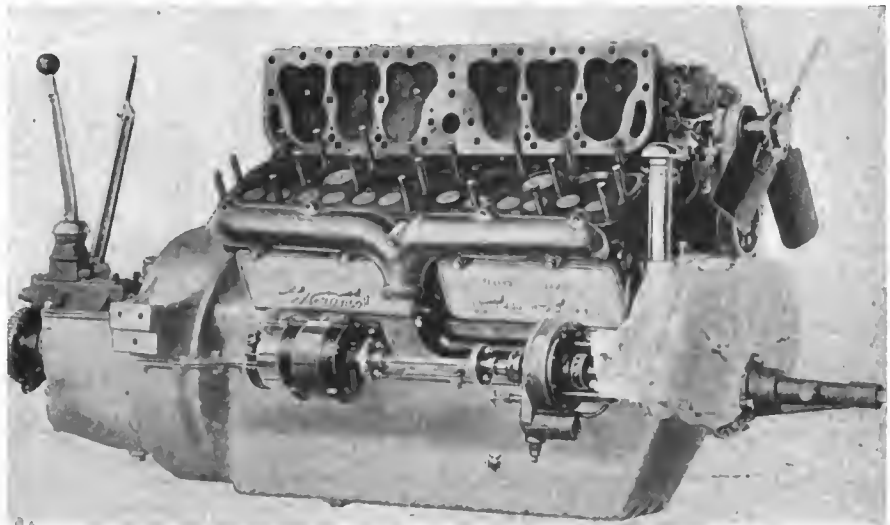
The hot spot has been applied at the point where the cross passage intersects the lengthwise one. Referring to the cross sectional illustration of the engine, the circular passage seen beneath the valve pocket is the intake. It will be observed that the exhaust outlets, one of which appears in section in this view, are not separated from the intake by any water space, so they maintain a good temperature for the whole length of the passage. At the center, where the cross passage joins, a special exhaust pocket is cast beneath the intake as well as above it. It is at this point, where the direction of flow of the gas changes, that condensation is most likely to occur, and so this spot is kept hot enough to vaporize anything thrown down there.

In the same illustration the nature of the counterweighted crank is indicated, but this does not show that only four balance masses are employed. Experiments with both four and six masses showed that the four were more satisfactory.

There are two at the center and one at each end of the shaft, the shaft being, for the purpose of balancing, considered as two three throw cranks, each half being put in balance by its own pair of counterweights. In obtaining the masses the rotating portions of the connecting rod assemblies were considered as well as the crank pins.

Throughout the crankshaft there is an oil passage from end to end, and oil is fed to each of the three main bearings. Should the feed to either two of these cease by any improbable accident, the remaining one is thus able to supply all the bearings, while with all three feeds in normal condition a more than ample supply is insured to every part. Pressure is controlled by the usual variety of release valve, which is set to give about 10 lb. per square inch at 20 m.p.h., rising to 30 lb. as the engine speed increases. There is also an additional, adjustable release valve for the separate oil lead that goes to the front end for lubricating the gears and the chain. There are also individual leads to the camshaft bearings:

In laying out the new motor a good many experiments were made with valve timing and a very moderate setting finally adopted. The exhaust opens at 43½ deg. before bottom center and closes at just under 3 deg. past top center, while the intake opens 6 deg. past top and closes 42 deg. past bottom center. The lift is rapid, being from a mushroom tappet, and the power peak is around 3000 r.p.m., with a maximum torque at 800 r.p.m. At 800 the horse-power is

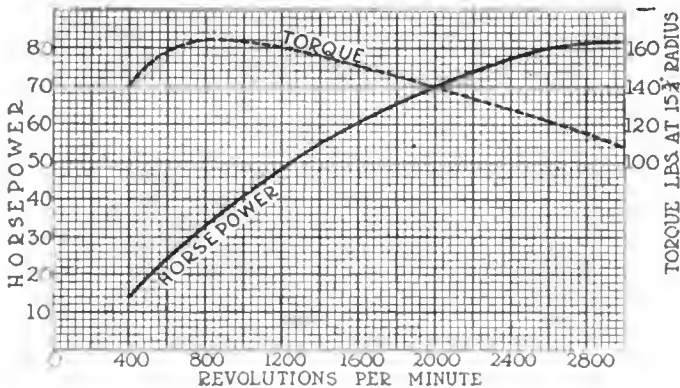


Side view of the National twelve engine, showing the detachable head, a new feature this year

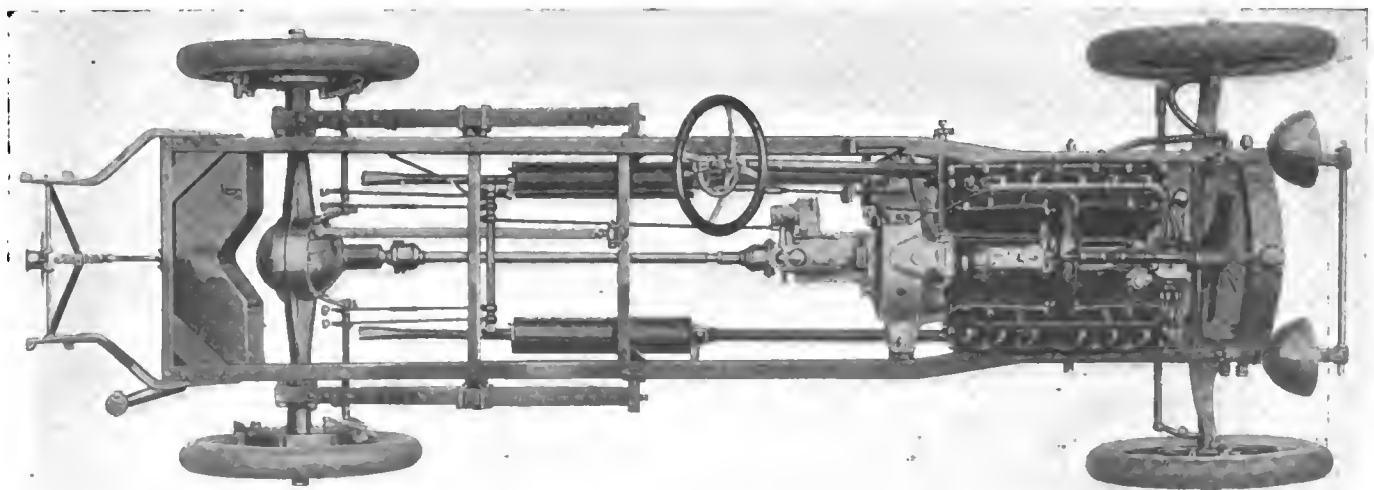
32 and the torque 215 lb. ft.; 14 hp. is obtained at 400 r.p.m., and the curve runs smoothly to the maximum of 81 hp. at around 2900 r.p.m., at which point the torque is still as high as 76 lb. ft. This means that the car has a wide speed range with especially favorable power to weight conditions from around 10 to 30 m.p.h., where the accelerative abilities are most noticeable. A maximum speed is not yet settled definitely, but it is nearer to 70 than to 60 m.p.h. with a full size touring body and may perhaps prove to be higher than 70. The standard gear ratio on high is 4 7/12 to 1.

With the counterweighted crank the need for excessively light reciprocating parts is not pronounced, so cast iron is used for the pistons. The connecting-rod assembly comprises a forked and a plain rod, the cylinders thus being directly opposite each other and not staggered. Piston pins are tight in the pistons, which have four rings, three above and one below the pin.

For cooling the water pump is divided into two sections, though there is only one water intake and only one impeller. The pump casing is divided by a web running all around its circumference, and from each side of the case there is an outlet. The two outlets are brought together at a single flange, each here being of semicircular section, and a divided pipe carries the water to the middle of the right cylinder block. Here one-half discharges direct to that cylinder set, and the other passes through a passage in the cylinder foot, then through a short cross pipe and to the other cylinder block. The thermostat valve does not control a secondary circulation system. It is so set that it cannot close abso-

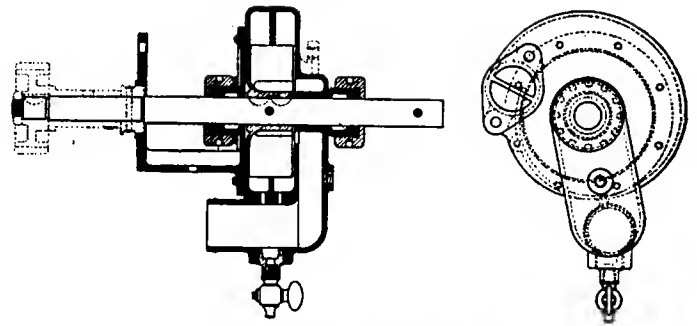


Horsepower and torque curves of the National 2 1/2 by 4 1/4 in. twelve-cylinder engine

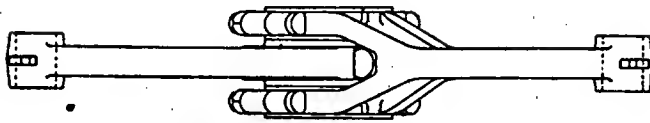


Chassis of the National Highway twelve, which has not undergone any change over last year's model. Note long, flat cantilever springs

# Details of National Twelve-Cylinder Engine



Water pump assembly. Note the dividing wall in the water space around the single impeller, thus forming a double pump



Fork-end connecting-rod assembly which brings the sets of cylinders exactly opposite one another. Cast iron pistons are used

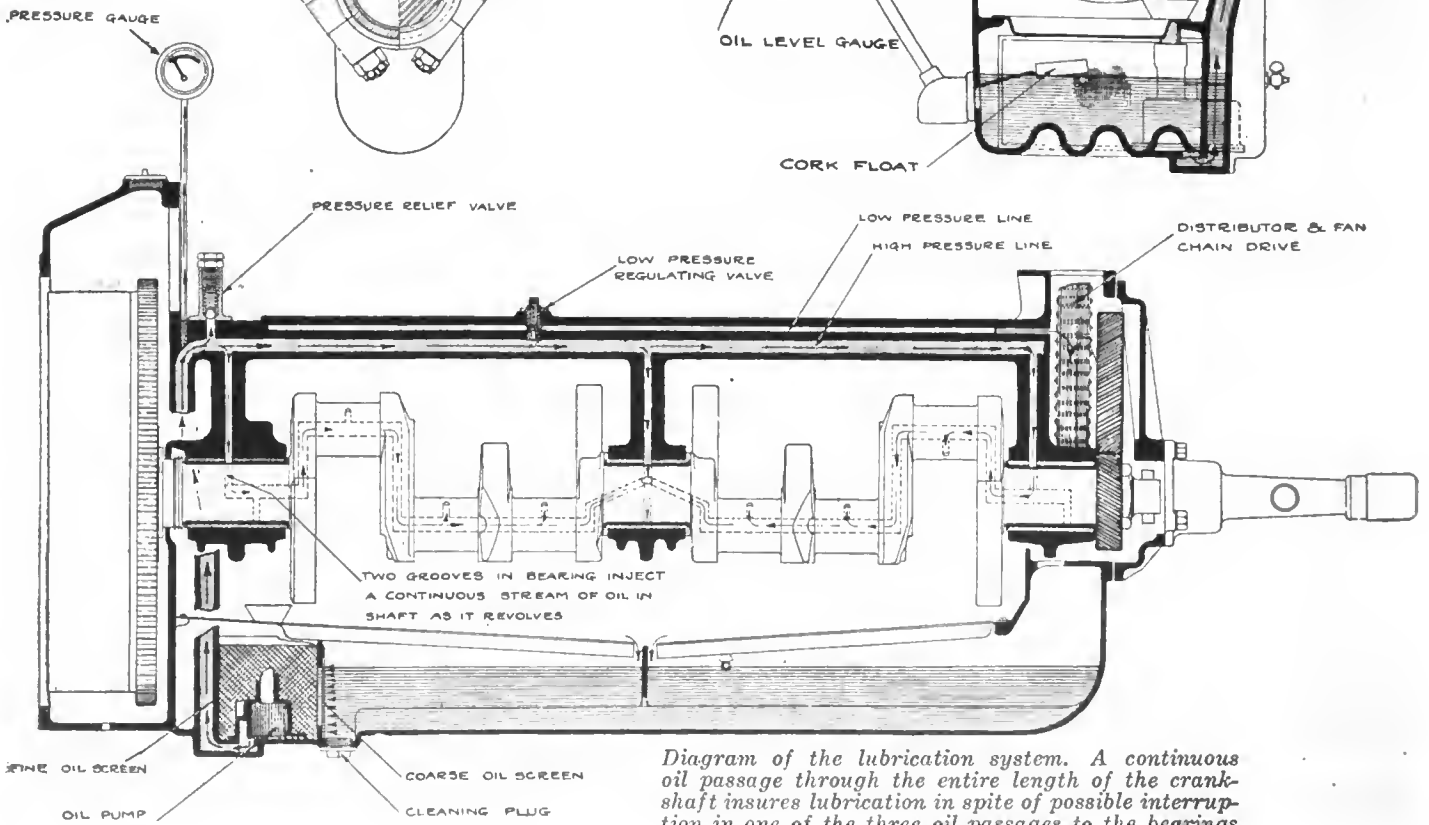
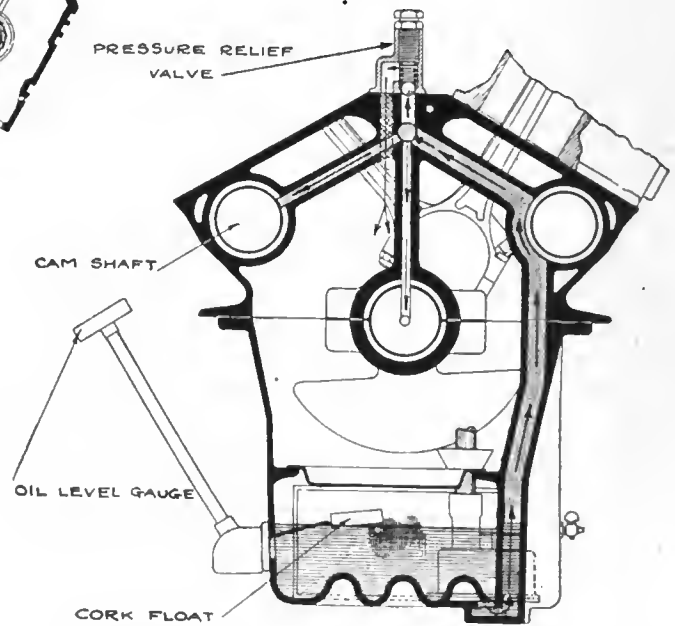
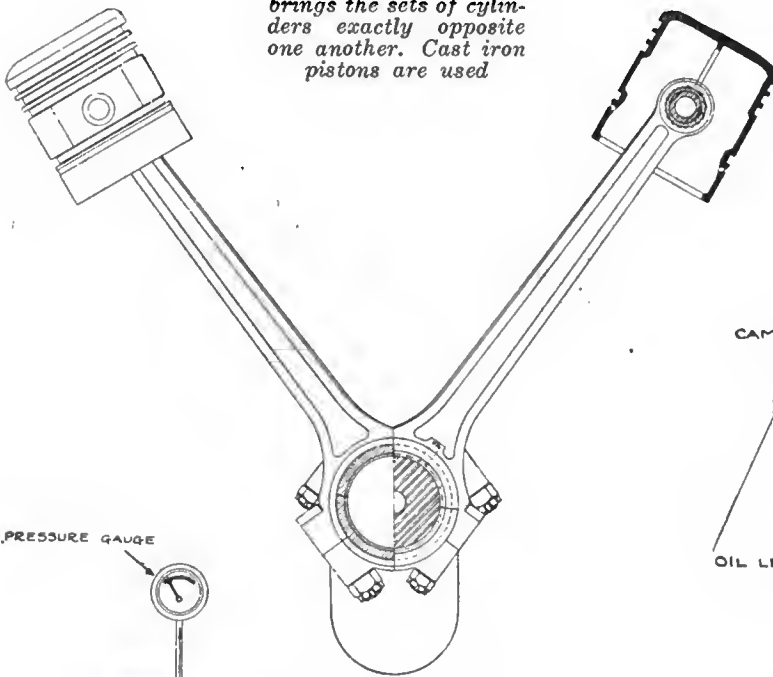
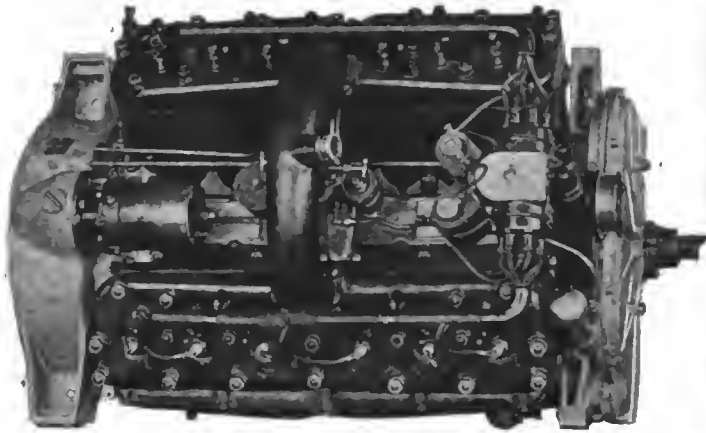
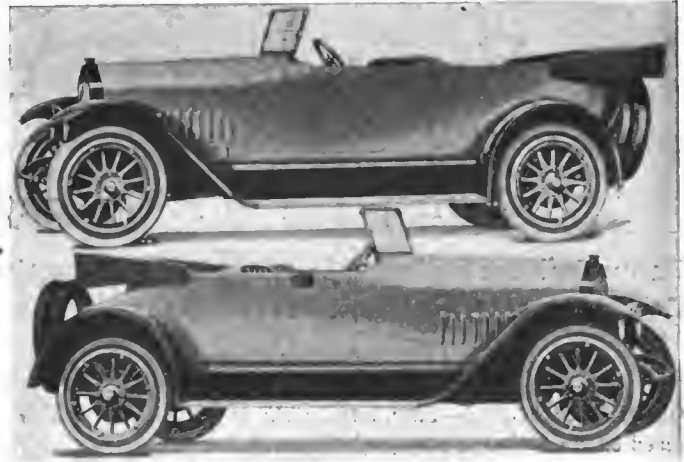


Diagram of the lubrication system. A continuous oil passage through the entire length of the crankshaft insures lubrication in spite of possible interruption in one of the three oil passages to the bearings



Location of the starting motor, carburetor and the double Delco Ignition unit in the V passage of the National Twelve. The Delco Igniter is a new feature this year.



Above—National seven-passenger touring. Below—Four-passenger roadster. There is also a four-passenger sport phaeton.

lutely, there being always a minute outlet to the radiator; this means that when the valve is closed the water pump operates against a strong resistance, and so there is a great deal of slip in the pump and very little water actually circulates. As the engine warms up the valve opens and allows an increased flow. This makes a very neat job of the thermostat and eliminates several pounds of metal that would be required for the piping of an alternative flow system, while it also is considered that the engine acquires the proper temperature more rapidly.

The chassis in which the new engine is fitted is identical with that of the previous model of Highway Twelve, the outstanding feature, perhaps, being the long and flat cantilever springs which National has now been using for nearly four years. There are three principal body styles, a seven-passenger touring car, a four-passenger sport type phaeton and a four-passenger roadster with clover leaf seating. The latter is proving a popular model and will constitute about two-fifths of the 1917 output. The four-passenger sport phaeton, which was shown at the winter exhibitions, has a single front seat with a very roomy cabinet back of it large enough to hold quite a considerable bulk of light luggage. The other two models, of course, have divided front seats, the roadster having only the front entrance doors. Two colors are optional, a rather delicate shade of pearl gray and a rich tint of blue, and all three models sell for \$2,250 with complete equipment. Tires are 34 by 4½ in., and provision

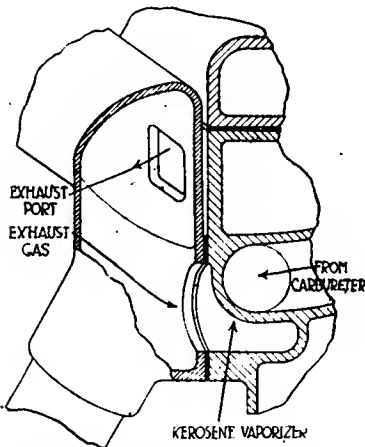
is made for two spares at the rear end of the frame. Special types and closed bodies are, of course, also obtainable.

### Export Trade Directory Is Ready

A TOTAL of 1295 New York export houses are listed in the new edition of the *American Exporter's* Export Trade Directory, as compared with 785 in the previous edition. The new book comprises 536 pages as compared with 369 in the last edition, all departments being enlarged. In addition to the New York list there are 117 exporters in San Francisco as compared with ninety-seven previously and other lists covering Boston, Philadelphia, Chicago, New Orleans, Portland, Ore., Seattle, Tacoma and other cities, making a total of 1562 American export merchants or commission houses. Foreign exchange banking houses, marine insurance companies, steamship lines, combination export agents and other lists are features.

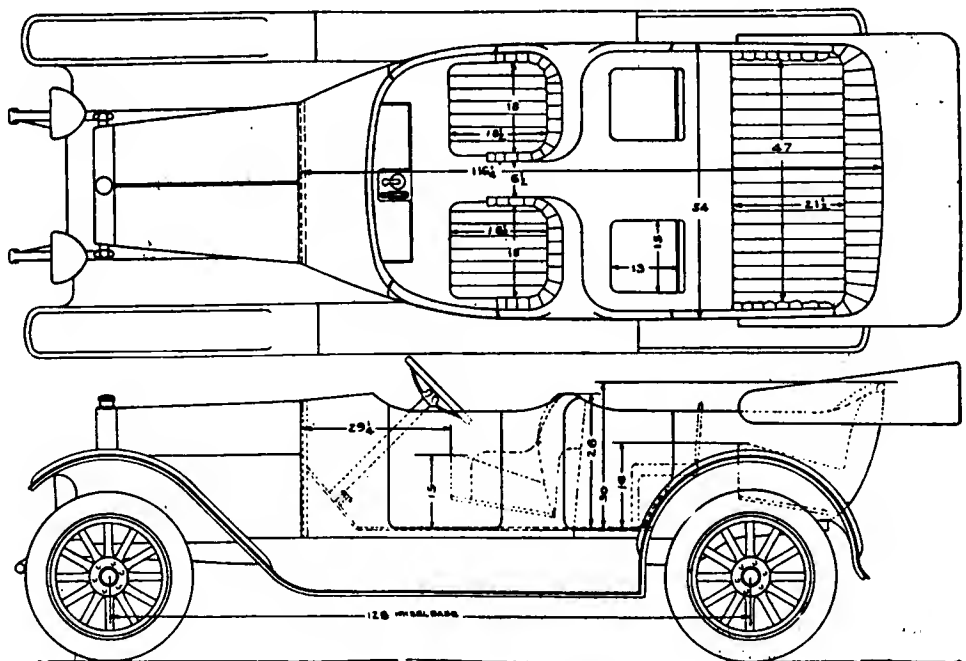
Classified index departments have been greatly expanded, now covering thirty-seven pages. In the divisions devoted to automobiles and accessories there are ninety-two concerns listed, eighty-two of which are in New York, two in Boston, two in Philadelphia, one in New Orleans, and four in San Francisco.

The book sells for \$5 and may be purchased through *The American Exporter*, 17 Battery Place, New York.



Above—Detail showing how the intake passage is heated by the exhaust gases at the center of each cylinder casting, forming a vaporizer.

Right—Side elevation and plan of the seven-passenger National twelve.





# Emulation

## The Mainspring of Efficiency

### Bonus for Best Individual Records and Competition Between Departments Two Features of Miller Rubber Co. Plan

By Allen Sinsheimer

**EDITOR'S NOTE**—This is the sixth of a series of articles based on an intimate study of the work being carried on by our large automobile, motor truck, tire and accessory makers to improve industrial relations. Better home and working conditions are two features that are emphasized. The promotion of health by the B. F. Goodrich Co., the Goodyear Tire & Rubber Co.'s solutions of housing and other problems for its workers, the system for reducing labor turnover by the Firestone Tire & Rubber Co., Cadillac benefits and the Reo clubhouse were features of previous issues.

THE difference between a football team and a section gang is the difference between eager animation and reluctant drudgery. On one hand is activity, vim, energy, dash and snap. On the other is dullness, dawdling, indolence and procrastination. The football team works at its play; the section gang plays at its work. It is a situation common to all industry. Men, everywhere, throw more power and thought into their games than into their labor. They lack the enthusiasm for the work that exists with the play—the work lacks the something that makes the enthusiasm. And the Miller Rubber Co., at Akron, viewing these conditions with a human and humane regard, has inculcated its men with a spirit that sprouts an unusual success. It has tilled its soil of labor, sowed the seed of emulation and cultivated an efficiency in its shops that combines all the zest, eagerness and energy of healthy play. It has grafted a co-operative competition to its factory labor and reaped a remarkable crop of high quality and huge quantity of product.

From the beginning the company endeavored to produce the highest quality of product. It sought to build up a perfect chemical department, and, starting with one chemist and a small laboratory, improved it until now there are twenty-four chemists working in a laboratory equipped with every device that makes for efficiency.

#### Building Upon Human Nature

In the same way it bettered its mechanical equipment, adding new machinery and removing obsolete tools as rapidly as possible. When the laboratory and the factory seemed as perfect as mind and money could make them, the officials of the company, and particularly W. F. Pfeiffer, secretary and general manager, felt that Miller products should attain a very high standard. But they discovered that an important element had been neglected; that, in fact, the most important factor—the human factor—had been overlooked, and with this in mind the company introduced a bonus plan, based on common sense and a keen knowledge of human nature, that has been exceptionally productive of beneficial results.

Experimenting, at first, with a few employees, an official explained carefully that a prize would be granted the worker who at the expiration of 30 days attained the highest record for efficiency. A series of percentages was arranged to determine the records and the men were penalized a specified number of points. Thus they were started with 100 per cent and then suffered a deduction for each time they were late,

absent, made a blemished article or produced less than the average standard of quantity. The man with the highest record for the first month was given a silk shirt. Since the experiment, the prizes have comprised financial rewards given as follows:

100 per cent record.....	\$10.00
95 per cent record.....	7.50
90 per cent record.....	5.00

The records made by the various individuals in each department and the total average department records are posted regularly each month on specially constructed bulletin boards. The prizes are given only to the individuals, the department records being posted to stimulate departmental pride and thus to produce better averages through rivalry.

#### Friendly Rivalry Created

The interest displayed by the workers is remarkable. They crowd about the bulletin boards, which they call scoreboards, and pass such remarks as "Let's see my batting average," and "I'll get you next month." And since the department averages have been posted a friendly rivalry has been created between the departments which promises to further add to the value of the plan. In fact, the workers themselves have been overheard to take to task those employees who, because of excess drinking or other faults, have caused a reduction in the monthly percentage.

In addition to the bonus, the company discovered another method for improving work. It found that shorter working days do not mean shorter production records, and that instead they result in the expenditure of a concentrated energy that



Miller Rubber Co. employees jealously watch the bulletins of individual and department efficiency ratings which are posted each month, and a keen, friendly rivalry exists

increases the production. Mr. Pfeiffer, making a study of factory conditions from the lost time and lost effort viewpoint, experimented with a few workers who displayed a tendency to slacken their efforts at certain periods each day. He allowed them to start work at 9:15 each morning, 1 hr. later than the others. The results proved so successful that the 8-hr. day was instituted throughout the plant. Just what this move and the bonus plan have wrought is shown in the following table:

FEMALE LABOR

Girls working at piece rates were found after 6 months to have increased:

- Earnings from 16.4 cents per hour to 21½ cents per hour.
- Production from 82 per cent to 107 per cent.
- Attendance by 10 per cent.

And in another department increased:

- Earnings from 16.4 cents per hour to 21½ cents per hour.
- Production from 75 per cent to 97½ per cent.
- Attendance by 6½ per cent.

MALE LABOR

Men working at piece work rates were found after 1 year of the new plan to have increased:

- Earnings from 31½ cents per hour to 51 cents per hour.
  - Production from 69½ per cent to 113½ per cent.
  - Attendance from 86.4 per cent to 91 per cent.
  - Workmanship from 87 per cent to 97 per cent.
- And in another department increased:
- Earnings from 48½ cents per hour to 61½ cents per hour.
  - Production from 88½ per cent to 121 per cent.
  - Attendance from 39.3 per cent to 94.2 per cent.
  - Workmanship from 99 per cent to 99.9 per cent.

Thus the change of schedule from the 9-hr. day to the 8-hr. day, while effecting no increased cost to the company, since the same piece-work rates were maintained, resulted in a vast increase of earnings to the workers while it augmented production to a marked degree.

Improving the Work

The Miller Rubber Co. adopts the humane attitude toward its workers in every instance. When an employee signifies his desire to quit his work, the company takes the view that "there is something wrong with the job, not with the worker." And it has established a bureau where men who leave are interviewed and an effort is made to determine why the work is unpleasant and if it cannot be improved.

Sheldon Relief Assn. Work Gains in 1916

THE Relief Assn. of the Sheldon Axle and Spring Co., Wilkes-Barre, Pa., was organized in 1907 and since that time it has collected \$23,977.60, including dues, receipts from its annual picnic, interest on investments and interest on money in bank. During this time it has paid out \$15,854.92, leaving its net worth at \$8,122.68 of which it has \$6,000 invested in securities, giving it an income of \$360 per year.

During the past year \$1,554 has been paid out for sick benefits, and death benefits have totaled \$690. The by-laws of the association call for a reduction in the dues to one-half, when it has \$5,000 or more in the treasury. During the past

year, on the 25 cents per month basis for members who have been in the association for 1 year, it has taken in enough money to pay its expenses and still be ahead with a gain of \$622.68 as against \$500 the former year.

The membership at present consists of 680. The dues are 50 cents the first year and 25 cents per month thereafter. A member is eligible for benefits within 90 days from the date of his application.

Sick benefits are \$6 per week for 12 weeks and \$3 per week for the following 8 weeks, making a total of \$96 for the calendar year.



Annual meeting of the Relief Assn. of the Sheldon Axle and Spring Co. held March 24. About 1700 Sheldon employees attended

# Java

## A Growing Market

100,000 of 42,000,000 Population Are Potential Car and Truck Buyers To-Day — 6000 Cars in Use — Good Field for Trucks in Sugar and Coffee Industries

By P. Vandermark

**J**AVA, in the Far East, is not looked upon by many automobile manufacturers as a great selling center for automobiles, motor trucks or farm tractors. It is generally considered a small island with a relatively small population. It is necessary to revise our impression of the island, which is approximately 600 miles in length and ranges up to 150 miles in width. This means an island as long as from New York City to Cleveland as the crow flies. The population of this island is 42,000,000; in other words, Java has almost as many inhabitants as Australia, the Dominion of Canada, the Argentine Republic and Brazil combined. From an automobile point of view this population is not very potential, in that only a small percentage of it can be considered in the market for automobiles. Notwithstanding this, American cars have been selling very satisfactorily in Java for the last 2½ years. Previous to that time the high-priced European machines were being sold, so that to-day in Java you see many such European machines as Fiat, Renault, Panhard, Benz, Daimler, Charron, Delaunay-Belleville, and other well-known European makes. In 1 year the Fiat dealer placed 300 of his cars in the island.

With its population of 42,000,000 Java has only a potential buying population at present of perhaps 75,000 people. This figure might be placed at 100,000. As years go on the car-buying population of the island will increase, largely because each year finds a wider sale for our low-priced cars which are now becoming well established on the island.

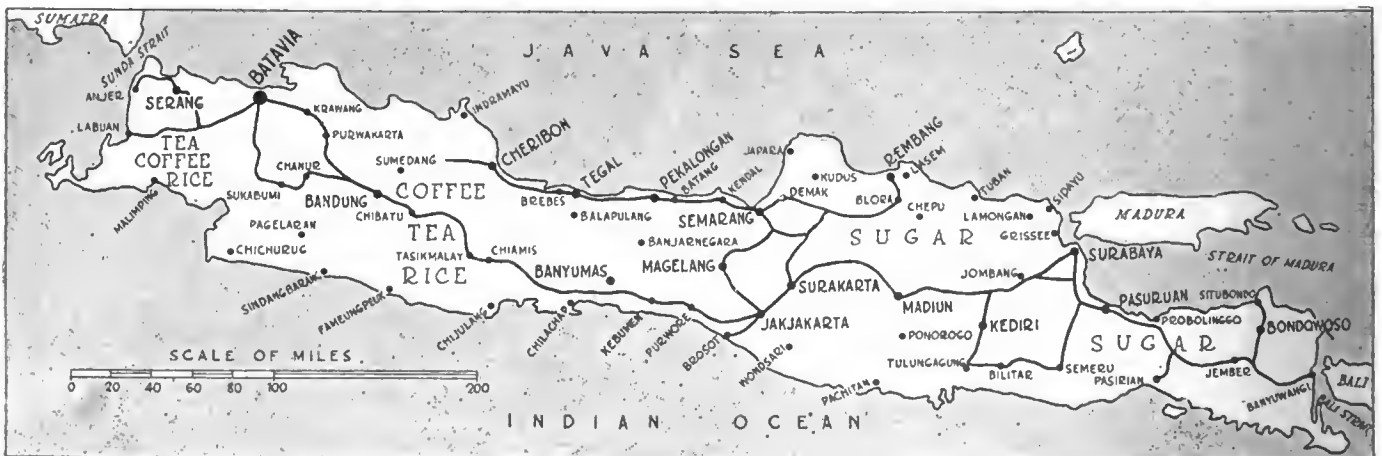
Looking at the present 75,000 possible buyers we might analyze them as follows:

**P. VANDERMARK**

Far East representative of the J. B. Crockett Co., automobile exporters, New York City. Mr. Vandermark has spent 6 years in Java and the Straits Settlements in the automobile industry, having started as a garage manager in Singapore 6 years ago. He has been with the J. B. Crockett Co. for 2½ years. He introduced several well known U. S. A. cars in the Far East, including, Hupmobile, Saxon, Empire and Maxwell.



There are 40,000 Europeans located in the cities and as planters throughout the country. This population perhaps represents 15,000 European families, as many Europeans are bachelors, and the potential car-buying population is correspondingly increased. Next come 20,000 Chinese, who are largely engaged in trade lines, and many of whom are good machinists. The Chinese have been good car buyers, beginning in the days when the high-priced European car was the big seller. Third in this group of 75,000 potential buyers come the Arabs, who are good merchants, but not of such a high standard as the Chinese. Approximately 95 per cent of all Chinese and Arabs using automobiles in Java employ chauffeurs. Both of these classes are just as good buyers of the high-priced European car and often better than many of the European population. It is to these three classes at the present time that American automobile manufacturers



Map of Java, showing the roads which follow the railroad lines practically throughout the island. The staple products of the various districts, which are chiefly rice, sugar, coffee and tea, are indicated. The crops during the last 2 or 3 years have been very good and prices higher

must sell practically all of their product shipped to Java.

Unquestionably as time passes the market will expand, but there do not seem to be bright prospects for it at present. This brings us to a consideration of what might be called the native Java population, or the Javanese, as they are designated. The Javanese are not property owners; they do not own the sugar, coffee, tea, rice, rubber, and spice plantations of the country. They are workmen. They perform the manual labor on the plantations, which are largely owned by Europeans, the Dutch being leaders in this field. It can be said of the native Javanese that he is a laboring gentleman. In color he is not so dark as the American negro, and quite different in characteristics. He is fond of dress, is not especially fond of work, but essentially a gentleman in his own sphere. At present the native Javanese, constituting more than 99 per cent of the population, is not interested in automobiles. It is questionable if he has ever expected to own one. In fact, he gives no indication of possessing an ambition to own one.

Naturally in a population of 42,000,000 there is a big percentage of the native population engaged in other pursuits than working on plantations. Many are in mercantile lines; but even here the status of their business is not such as to warrant their purchasing cars.

**60 Per Cent of Automobiles Made in U. S. A.**

The car population of the island of Java at present can be conservatively placed at 6000 machines, of which 60 to 70 per cent are of U. S. A. manufacture. Three years ago there were very few of our machines there. As late as 1913 Fiats to the number of 400 were sold on the island. Italy and France had the greater part of the business until the end of 1913.

It was in 1913 that the U. S. A. got into the Java market, there not being 100 American cars sold a year previous to that time. The following season, 1914, was the



A very old stone road in middle Java, with rice terrace on the hillside. This is a Charron car taken 3 years ago

real start of American cars on the island, largely due to the fact that the beginning of the war in that year cut off all European shipments, with the possible exception of Italy. Since then our cars have been selling in large quantities.

A very satisfactory feature of our car sales in Java is that the European population, as well as the Chinese and Arab, is now convinced that the American high-priced car is just as good value as the high-priced European car. When we started introducing our low-priced cars there was no competition from Europe because it was possible to sell our machines at so much lower price. It was not so with our higher priced machines. Fortunately this was changed, and now our high-priced machines are considered as good value as European ones.

At this point it may be well to give a passing picture of the island of Java as affording a possible field for the wider use of automobiles. The island, 600 by 150 miles, is a little larger than England, Ireland, Scotland and Wales combined.

The island is generally hilly, with the exception of the east end, which is low and largely used for sugar cultivation. There are good roads over the entire island. The construction of these roads was started over 100 years ago at the instigation of Napoleon. Java is a Dutch possession, and when Napoleon temporarily got control of Holland, naturally Java fell under his sway. With true Napoleonic judgment he at once began the building of roads, with the result that Java has many miles of good roads well suited for automobile use. A casual reference to the map of the island accompanying this article will show that you can drive from the city of Batavia up the west end and all along the north shore practically to the opposite end. In addition there are good roads leading down to the southern coast and a great many cross-roads



Garage in Batavia, second largest city in Java, taken 2 years ago. Just an average garage; sells seventy cars and 100 motorcycles per year



Typical Javanese road, showing native huts in Western Java near Bandoeng (Bong-Dong), the big tea country; 3000-ft. altitude

zigzagging between the towns along the north coast to towns and cities in the center and on the south coast.

There is generally good automobiling in the cities. Batavia has many miles of good streets, and also many miles of poor streets. They are, as a rule, wide enough for car use, the same as in any American city.

In addition to what might be described as a very good system of highways the island is well supplied with railroads, as the map shows. The railroad system starts at Batavia and connects up with such cities as Bandoeng, Tegal, Joklakarta, Semarang and Surabaya. There are other short feeding railroad lines, and in the sugar country at the east end are many small railroad lines serving the plantations.

#### Java's Principal Industries

A panorama of the industries shows that tea, coffee and rice are largely grown in what is known as the west end of the island. This is quite high, and all three crops thrive well on high ground. The center of the island continues fairly high, and is mostly used for coffee, tea and rice. As previously stated, the eastern end is low and is used for sugar cultivation. Java has long been historic for its active volcanoes, and at present several of them are active. These are smoldering, emitting smoke most of the time, but there have not been any serious eruptions for some years.

Returning to the motor industry of the island. The selling of motor cars is largely controlled by the Dutch, the majority of whom speak English, and are often complimented when correspondence with them is carried on in English. No natives are in the automobile selling or garage field at present. There are few foreign firms in the dealer field outside of the Dutch. Previous to the war Germany was establishing herself quite strongly, but that has entirely vanished in the last three years.

#### Selling Methods

Selling of automobiles in Java may be handled in different ways: Some firms place the entire distribution for the island in the hands of one dealer, who may be located in any of the ports—Batavia, Tegal, Semarang or Surabaya. Other concerns divide the country up and sell direct to dealers in each of these cities, thereby treating the island as four separate divisions. Naturally giving the agencies to four different concerns should result in more intensive sales, but also calls for closer watchfulness on the business. In none of these cities is there a motor or automobile row such as exists in our smaller American cities. Notwithstanding this, the dealers are generally financially strong. They advertise in the local papers, have showrooms in which cars are displayed, but rarely employ salesmen who canvass the business men in their offices as we do in this country.

Practically all businesses other than the automobile business are carried on on a credit system, extending over 60, 90 and 120 days. In the retail field cash is generally demanded on small purchases, but on larger transactions credit has invariably to be given.

#### American Car Created New Buyers

To understand how U. S. A. automobiles were received in Java we should bear in mind that a 20-hp. European car sold at \$3,200 U. S. A. gold, and our American cars started selling at \$1,400 U. S. A. gold. This immediately created an entirely new class of buyers, as there were many Europeans in business in Java who could afford to spend \$1,400 for an automobile but could not think of spending \$3,200. If they did not have the \$1,400 ready for an American car they would pay half and borrow the remainder. Previously they could not think of doing this with European cars because of the higher price. Owing to this, the car-selling field in Java was enormously broadened as compared with the field existing when European cars were sold.

U. S. A. cars sell much higher in Java than they do in this country. It costs approximately 45 per cent of what a dealer pays a U. S. A. factory for the car to get it on a salesroom floor in Java. For example, if a Java dealer purchases a car in Detroit or Toledo for \$500, it costs him approximately \$866 by the time he gets it on the salesroom floor. In other words, \$366 has been spent



Newly made road in Western Java near Bandoeng. The soil is black, country rolling and the trees cleared off to the ground



One of the 18,000 rickshaws used in Singapore. The author enjoys this taxi at 4 cents (U. S. A. money) per mile at 5 or 6 m.p.h. Java has no rickshaws, as the Chinese will not use them



P. Vandermark in Singapore, with native assistant, who cranks the car and polishes it for \$4 a month in Straits money. As the Straits dollar equals 56 cents in U. S. A. money, the assistant's wages in our currency amount to about \$2 a month

in getting the car from the factory to the consumer. Here is an example of how this cost is made up:

Original cost of car, U. S. A.....	\$500
Crating at factory.....	25
Freight, U. S. A., factory to seaport.....	26
Ocean freight.....	210
Insurance.....	10
Import duty.....	75
Landing charges at Java port.....	20
	<hr/>
	\$866

Should the dealer in Java not be located at a seaport it will cost him \$16 to deliver the car overland to his place of business. To these expenses 3 per cent war risk insurance must be added at the present time.

**American Car Admirably Suited for Java Roads**

Owing to the fact that Java has relatively good roads, practically the same car that is sold in America serves admirably for Java, except that the steering wheel should be on the right-hand side, as the rules of the road are opposite to those in America. In all other respects our standard U. S. A. car is satisfactory. The 56-in. tread is all right, and any clearance will suffice. Speedometers must read in kilometers; metric sizes in tires are wanted; clincher types are in general use, and the high-tension magneto is in demand. There is strong opposition in Java to battery ignition and the storage battery in general. The trouble is that the Javanese chauffeur is totally ignorant of the battery. It is a mystery to him. He uses the same term when speaking of a battery as he does when speaking of medicine. This explains how almost hopeless it is to get that attention for the battery which it requires in such a hot country. The humidity of the climate is hard on the battery, and this, together with the high temperatures, makes the life of a battery scarcely 50 per cent of what it is in the U. S. A.

The selling of U. S. A. cars with electric starting and lighting is accustoming the Javanese chauffeur to electricity; but what is needed in Java as well as in many other sections is good information and explicit instructions on the care of the storage battery.

There are a few other details with regard to automobiles for the Java market that should be kept in mind. To date there has been little market for closed types such as limousines, coupés and permanent sedans. It is possible that a good market will soon develop for detachable top sedans, or what we know as the winter type of body.

Runabouts are not popular, as the owner objects to sitting as close to the chauffeur as he has to. The clover-leaf type should be popular. Wire wheels are in demand.

Various colors are popular in Java, some of the leaders being maroon, French gray and khaki. There is a strong demand for upholstery and slip covers to match the car color. Slip covers are manufactured locally.

The question of spare parts is as vital to automobile dealers in Java as in any other country far removed from the factory. Should the part of a car made in the U. S. A. and owned in Java break it would require 2 months to get the spare. No car owner in Java enjoys the prospect of having his car laid up for that length of time. Dealers in Java are willing to stock up liberally with spare parts in proportion as they sell cars. It would help American business very materially if the factories would co-operate in the carrying of stocks of spare parts. No better impetus could be asked for than this co-operation. In case the factory cannot financially co-operate it should give careful attention to shipping only those spares which are most needed. The part of a car that gives trouble in the Dakotas will, in ninety-nine cases out of a hundred, give trouble in Java, so that the U. S. A. maker is in a good position to know what spares should be carried in Java and other eastern points.

**Car Dealers and Garagemen Handle Accessories**

In Java the accessory trade is handled exclusively by car dealers and garagemen. In the city of Batavia there are thirty garages, practically all of which sell accessories. In the city of Tegal there are seven. The Dutch are good mechanics, and all over the island can be found good public garages. The sale of U. S. A. accessories must follow in all countries the sale of U. S. A. cars. You cannot continue to keep our cars running without the accessories. The majority of accessories that sell at home will sell in Java.

At present gasoline is selling in Java at 48 cents per imperial gallon, which means about 42 cents per U. S. A. gallon. It is sold entirely in 4-gal. cans, the cans being crated in pairs. Gasoline pump systems at garages are not in use.

In Java, because the country is located within the tropics, the selling season is not as clearly defined as in America. As in most tropical countries, there are two seasons—the dry season and the rainy season. The dry season extends from November to May and the wet sea-

son from May to November. In the wet season it rains every day, but generally in the forenoons. This makes possible the general use of cars throughout the year.

The car-selling season in Java is not dictated entirely by the wet and dry season, but rather by the period at which the different crops are harvested. Sugar being the biggest crop, and being harvested in November and December, these 2 months become the greatest selling months. The other crops, such as tea, coffee and rice, are harvested all year round. Many of the Europeans, Chinese and Arabs buying automobiles make loans on their crops, so that the sale of machines coincides very closely with crop conditions. For 2 or 3 years crop conditions have been very good and prices high, which has greatly favored the sale of U. S. A. cars.

#### Suggestions for Our Makers

Many complaints come from Java with regard to the methods employed by our factories in handling the trade there. Generally these are not serious, but they suggest lines of improvement for our makers handling foreign trade. Here are a few of the points on which criticism is most generally heard:

1. Too often inferior wood is used in the crates so that they break before reaching their destination. Whenever the material in a crate breaks some part of the car is injured.

2. Very frequently not enough waxed paper is used in arranging the cars for shipment. Water reaches the upholstery, the top or some other parts.

3. If the nickel parts are not heavily greased they invariably arrive in bad condition.

4. Each car should be accompanied by an instruction book in English and a catalog in the same language.

5. Too often our manufacturers cause dealers heavy expenses in cabling. The cable rate from Java to America is \$1.35 per word. The deferred rate is one-half this charge. Cabling should generally be handled on deferred rates.

While the possibility of selling motor trucks in Java has not been developed, there exists a good field. It will have to be developed and will require considerable time. The sugar industry offers the greatest opportunity. The average haul is 3 to 4 miles. Roads are reasonably good and motor trucks would serve. At present in the large plantations there are narrow-gauge railroad lines running through the plantations. The position of these lines is changed from time to time. This is costly. With the motor truck and the greater flexibility it affords cheaper transportation of the cane from the plantation to the mill and of the sugar from the mill to the railroad or port will be possible.

In the coffee country, which is a rolling territory with good roads, the average haul is 3 to 4 miles. As in Brazil, where the truck is being used in the coffee industry, so in Java there is opportunity for its use. Tea is cultivated in the highlands, and the field of truck possibilities is more limited. Rice is cultivated on the hill-sides as well as on low grounds, and hence the use of trucks in rice culture is not a factor.



### Machinery in New Harroun Plant

*MOST of the machinery is in the assembly department of the new plant of the Harroun Motors Corp. at Wayne, Mich. Engines are already running through production. The accompanying photograph was taken by a representative of THE AUTOMOBILE and shows a quantity of the machinery in position.*

*The plant is T-shaped, with the manufacturing section forming the top of the T and the assembly section forming the stem. The assembly section is now complete, the floors having just been laid.*

### Bethlehem 1 1/4 Ton Model

*AT the right is illustrated the 1 1/4-ton truck built by the Bethlehem Motors Corp., Allentown, Pa., fitted with one of several standard body types. The company also builds a 2 1/4-ton model. Both vehicles are conventional in design and are assembled from standard components. The 1 1/4-ton model has a 126-in. wheelbase and a 3 1/2 by 4 1/4 in. G. B. & S. engine. It uses 34 by 3 in. tires in front and 34 by 4 in. tires in the rear.*



# Fan Is Important Cooling Factor—II

Radiators Offer Largest Variety of Selection—Frontal Area Should Be a Maximum—Air As a Cooling Agent

By A. K. Schanze

*Pfister Fan Co.*

*Second installment of a paper read by Mr. Schanze before the Cleveland Section of the S. A. E.*

**R**ADIATORS offer about the largest variety of selection in the automobile industry. For anyone to write a comprehensive treatise on the subject would be a life work.

The elements to be looked for from the radiator builder's point of view are numerous, but the engineer whose function it is to select the proper article for his car can be guided by a few details.

After the car architect has established the shape and the purchasing agent has fixed the cost limit, the designing engineer may go as far as he chooses. Frontal area should be a maximum and upon this follows net radiating area.

Radiating area can be reduced to a horsepower basis, as the act of radiating is exactly the process of doing work. Of the total heat of the engine absorbed by the water, we have only to deal with the small residue that would cause overheating if not carried off by the radiator.

The whole thing can be based upon the premise that a cubic foot of air, in passing through a radiator and being raised 50 deg. Fahr. in temperature, has absorbed 1 B.t.u. A horsepower represents 33,400 B.t.u. and upon this basis we can arrive at the other results.

The radiator whose heat transferring qualities are such as to give a uniform rise of temperature to all air passing through it regardless of the velocity of the air is an ideal radiator and it is not beyond our reach. Some are in existence that so closely approach this condition as to be considered perfect to all practical intents and purposes. This may seem a bit at variance with some statements made further along under the subject of fans, but a study of the case will convince that the statements are correctly related.

## Air Passages Should Be Free

For efficiency, not only is it necessary to have the air passages free from solder obstructions but it is just as important that they be of a size and shape that will give a good smooth run to the air. The more air that can be passed through a radiator the more will be its cooling power.

We have also to take a careful look at the inside of a radiator to determine its freedom of water circulation and its capacity. On several occasions tests have shown that capillarity was preventing free circulation. This condition of course, is too well known to radiator designers to need comment, but the fault does occur occasionally and is probably due to workmanship more than design.

Core depths as much as 4 in. are in common use and have their purpose. Since expense is increased with core depth it is well to regard the radiator and fan together, as the power of the fan will make a large difference in the core depth. Just what conclusions to draw on this phase of the subject the writer is at a loss to know. It would seem that a 4-in. core was too deep for greatest efficiency and this has at various times proved to be the case. Yet upon some tests conducted on two different makes of radiators with each make the 3 $\frac{1}{2}$ -in. core proved of more capacity than the 3 $\frac{3}{4}$ -in. core.

As a practical suggestion to car builders the writer offers that every purchaser be furnished a special card cautioning him to keep the exterior of the radiator clean as he possibly can. Much heating complaint would be avoided if radiators were kept clean. Tests go to prove that when a film of oil gathers enough road dust the radiator efficiency is reduced to about one-quarter normal.

Our last element in the discussion of the cooling system will be the fan.

Altogether too little importance has been attached to this unit as is well illustrated by the fact that so few engineers know precisely how the relative values of different fans are determined.

Researches made by some of the foremost radiator manufacturers have shown that cooling varies directly with the quantity of air passed through the radiator, when other conditions are reduced to uniformity. It has, therefore, been the long time hope of many of the radiator manufacturers to see an improvement made in fans.

Experiments conducted by the writer have confirmed the theory that cooling varies directly with the air quantity drawn through a radiator, and some of the records of those tests are incorporated as a part of this paper.

Incidentally, similar experiments have shown that the temperature of the water in a radiator fluctuates practically, degree for degree, with the temperature of the air entering the radiator.

## Air As a Cooling Agent

It has been our experience upon some few occasions to meet engineers who stated that they placed little stress upon the value of air as a cooling agent except within very wide latitude. That is to say, they were apparently of the belief that it took a large increase in air delivery, say three or four hundred per cent, to make any noticeable improvement in the cooling apparatus as a whole.

In contravention to this argument it need simply be pointed out that a certain time honored practice among some engine builders is a mute proof that the contrary is the case. When engines are placed upon the dynamometers to be "run in" they are usually connected with their standard radiators and carry their regular fans. Experience showed, in some cases, that this did not provide sufficient cooling to make safe running, so the simple expedient of placing an electric fan on a bench in front of the radiator and directing its air current into the radiator is resorted to with satisfactory results.

On the whole, however, the fan is the last item in the make-up of a car to be considered and it usually shows it.

First and foremost, in the selection of a fan, should be considered the element of quantity of air delivery. The ideal radiator, as has been stated, is the one that will give off its heat at such a rate that the air that passes out of it can absorb no further heat units. In combination with this radiator, the ideal fan is the one which will draw air through the radiator at such a high velocity that the air undergoes no measurable increase in temperature as it passes through.

At first glance it would seem as though this statement of the case partook of the old school day problem of the irresistible force striking the immovable body, but closer inspection will reveal the fact that it is not quite that way.

The fan is the only link in the chain that can be made of practically unlimited power without throwing the system out of balance. Incidentally, it may be remarked that fan manufacturers have the world still to conquer in that respect.

The rate of heat transmission from one medium to another is directly proportional to the difference in the temperatures between the two mediums. This rule applies exactly between



all the variations met with in automobile practice. Therefore, the efficiency of a radiator and fan system combined would be greatest when the mean temperature of the air passing through the radiator were lowest; or, in other words, when the difference in temperature of the water in the radiator and the air passing through it were greatest.

As an illustration, assume the case of a radiator on a summer day with atmospheric temperature at 85 deg. Fahr., mean water temperature 200 deg., and a rise in temperature of air passing through the radiator of 50 deg. The mean air temperature through the radiator is, therefore, 85 deg.

$50^\circ + \frac{110}{2} = 110$  deg. and the differential between the water and

air is 90 deg. Heat will be transmitted in its proper ratio to a differential of 90 deg.

Take then the case where all other conditions are the same as in the foregoing case, but increase the air velocity 40 per cent and thereby reduce the temperature rise from 50 deg. to 30 deg. The mean air temperature through the radiator then

is  $85^\circ + \frac{100}{2} = 100$  deg. and the differential becomes 100

deg. Heat will be transmitted at a faster rate in the pro-

portion of  $\frac{100}{90}$  or an increase of 11 per cent.

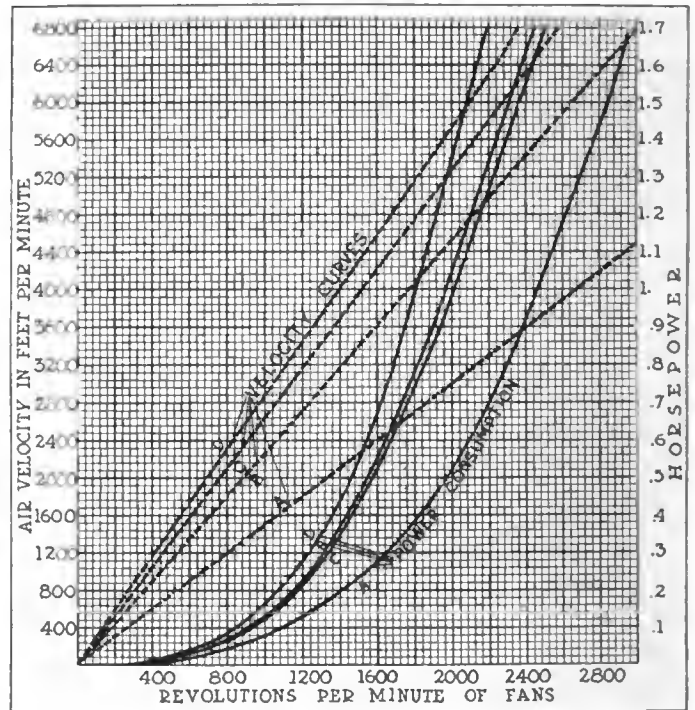
The foregoing will serve the double purpose of illustrating that the fan has a certain definite value, and demonstrating that because a fan may have double the capacity of another it cannot follow that a 100 per cent increase in the motor load capacity can be looked for.

As a matter of practice, then, the rule can be set down that the fan is of vital importance and that the very best fan obtainable should be installed. The question that follows is, what is the best fan obtainable? In answer to this it may be stated briefly that the fan that, on any limit of diameter, will give the maximum air velocity per revolution is best.

Air velocity depends upon a fan's ability to build up pressure and pressure overcomes the normal friction in the radiator and drives the air through at a velocity proportional to the square root of the pressure.

Fans of any one design increase their capacities in an approximate geometric progression with the increase in diameter. Best practice would therefore suggest the use of the largest diameter possible on any particular model of car.

There are several distinct types of fans offered by the various manufacturers, classified for description as follows: rim fans, which are those whose periphery is bound by a circular rim; flat blade fans, which are usually of three or four



Power and velocity curves of free air tests of 18-in. fans—  
A=Four-blade fan (flat blades); B=Three-arm multiblade;  
C=Five-arm multiblade (special); D=Five-arm multiblade (standard)

flat blades built out from a central spider; curved blade fans, which are similar in construction to the flat blade fans except that the blades are curved somewhat after the manner of a garden trowel; and multiblade fans, which are of two or more arms, up to six, and in which each arm consists of two or more blades.

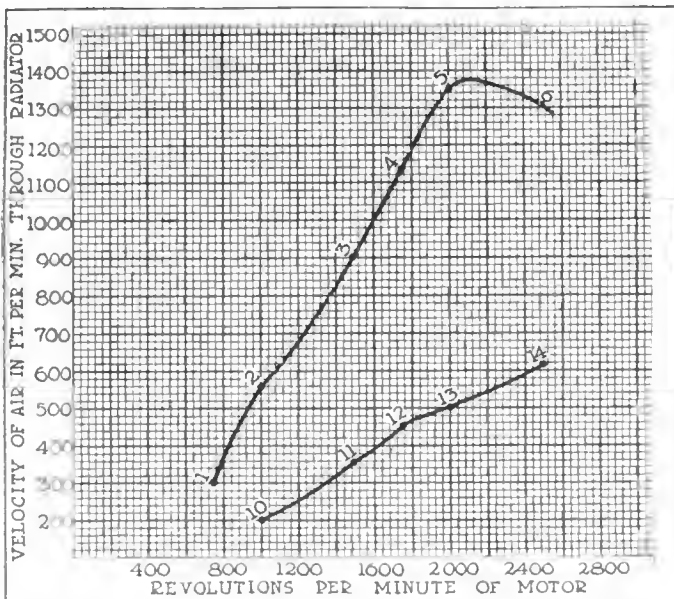
Taking them in the order named, we note two types of rim fans, viz., those having a very thin rim almost like a wire and those having a broad rim equal in width to the sweep clearance of the blades. In the former type, as nearly as the writer can ascertain, the rim is supposed to add strength both in the resistance to centrifugal force and in the resistance to bending. It is also intended somewhat to act as a safeguard to the radiator should the fan become bent or out of line and strike the radiator.

The writer has conducted air delivery tests extensively on both types of fans and has found them very inefficient.

Flat blade fans are the most common in use at the present day. They are usually of the four blade type built up on a central spider. Their air delivering qualities are not good at low speeds, say at a peripheral speed less than 5000 ft. per min.; hence they have to be run at very high speeds. High speed fans are noisy and consume a large amount of power. These two factors will be discussed later in this paper. It is safe to say that the flat blade fans are very efficient when working at peripheral speeds in excess of 15,000 ft. per min., which, for 16 and 18-in. fans, is close to 3000 r.p.m.

Curved blade fans, as a class, are similar in their construction to flat blade fans; that is to say, they are normally built up on a central spider and are of three or four blade design, generally. In capacity, and efficiency, they are much ahead of the flat blade and rim fans, for automobile uses. Of course, they do not show a constantly increasing efficiency at very high speeds, 4000 and 5000 r.p.m., but then good engineering practice would counsel against the use of any such fan speeds where it were possible at all to get away from it. These fans are good because their efficient speeds are generally comparatively low.

Of the multiblade type of fan there is only one such make at present in existence. This consists of groups of blades placed one behind the other and presenting somewhat the appearance of two fans upon a single hub. Experiment has demonstrated that this is far and away the most powerful and efficient type of disk fan yet produced. The capacity is from 50 to 100 per cent greater than that of other types and its



Air velocity curves of 16-in. fans illustrating effect of belt slip—  
A=16-in., three-arm multiblade; B=17-in., two blade (curved blades)

most efficient speed is down around 800 to 1200 r.p.m. for 16 to 20-in. diameters. It develops a high velocity pressure which drags air through the radiator even under adverse conditions. Its power consumption per cubic foot of air handled is at least 40 per cent less than that of any other type of automobile fan it has been the writer's experience to test. It also has another quality that recommends itself to the automobile engineer, namely, it develops a high peripheral suction around an area about one-third its diameter. It will therefore be noted that it is decidedly centripetal and not centrifugal. This quality brings the edges and corners of a radiator into use. The advantages of this feature are self-evident.

Another type of fan very little used in the automobile industry, but worthy of notice in a paper of this kind, is the centrifugal fan. This is a fan that takes air through the line of its axis and discharges it in the plane of its perimeter. It develops a very high pressure, but is of comparatively low volumetric capacity. On air cooled cars it has been found very satisfactory but its adaptability to water cooled systems remains to be worked out if it ever can.

**Power Consumption and Fan Speed**

The engineer, in making his selection of a fan, should take into serious consideration the amount of power necessary to handle maximum air velocities through the radiator. The author feels confident in making the statement that this phase of the question has been considered by very few engineers. A study of the power curves shown herewith will show that an astonishing amount of power can be used by a fan when its speeds are excessive.

Take for example the 18-in. fans whose powers, speeds and air delivery are plotted. At 1000 r.p.m., the flat blade fan was delivering a velocity of 1423 ft. per minute on a power consumption of 0.077 hp., in free air.

The multiblade (five-arm) fan, at 1000 r.p.m. was delivering a velocity of 2580 ft. per minute on a power consumption of 0.18 hp. under the same conditions.

Now compare the above with what took place at double the speed, (2000 r.p.m.) The flat blade fan handled air at 2826 ft. per minute velocity and consumed 0.524 hp., and the multiblade fan generated a velocity of 6060 ft. per minute and consumed 1.4 hp.

The increase in power, it will be noted, was almost in direct proportion to the cube of the speeds.

Since many motors are so geared that the fans at times are supposed to be making as much as 4500 r.p.m. it will be seen that at such a pace the power consumption, theoretically, gets up to 6 or 8 hp. It is the writer's basic contention that such a power expended on driving a fan is so completely wrong that its practice should be discontinued without delay. Motors running up steep hills or through heavy roads are frequently shifted into low gear in order to let the cylinders do the work possible at high piston speed. Under such circumstances, then, the fan is demanding one-sixth to one-eighth of the motor's power. These 6 or 8 hp. generate their quota of heat which again has to be extracted. It is a good fan which will assume this additional burden without allowing boiling.

In looking at the situation from a practical standpoint we must investigate the medium through which this high power reaches the fan. This transmission is usually through a belt, either flat or V. Can a leather or canvas belt, whose contact width is between 3/4 and 1 1/4 in., transmit much over 3 hp.? The best authorities on the subject say it cannot be done. This answer is probably correct.

The summary of the whole situation then is that, when the motor gets beyond a certain speed limit, such that the fan should begin to make from 4000 r.p.m. up, the belt begins to slip, and once this condition has set in the fan becomes worse than useless for that particular set of conditions. A slipping belt does itself a lot of harm in addition to polishing the fan pulley so as to make the slip at normal speeds greater.

**Fans Not Correctly Connected**

The reason for going into this branch of the subject so extensively is because there are several hundred thousand cars built annually in which fans are so connected as to develop a speed of from 2000 to 2500 r.p.m. when the car speed is 20 m.p.h. over the ground. These cars, most of them, do not show a heating tendency over smooth roads at that speed, but do when making from 30 to 40 m.p.h. or when the motor is doing the same amount of work in one of the low gears. Then, at just the right time when the cooling agents are most in demand, the fan is either slipping or using an amount of power not at all commensurate with its cooling power.

*(To be continued)*

**Board of Directors of the Motor and Accessory Manufacturers**



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# Automobile Calendar

**ASSOCIATIONS AND CLUBS**

- May 25—Cleveland, American Automobile Assn., Annual Meeting, Hotel Hollenden.
- June 4-6—Hot Springs, Va., National Assn. of Automobile Accessory Jobbers, Convention.
- Sept. 12-14—Atlantic City, N. J., Motor and Accessory Manufacturers, Mid-Season Meeting.
- Sept. 25-28—Pittsburgh, National Assn. of Purchasing Agents, Convention.

**CONTESTS**  
1917

- May 10—Uniontown, Pa., Speedway Race.
- May 19—New York Metropolitan Race on Sheepshead Bay Speedway.
- May 30—Cincinnati, Ohio, 250-Mile Race.
- May 30—Uniontown, Pa., Local Races.
- June 9—Chicago, Ill., Speedway Race.
- June 23—Cincinnati, Ohio, Speedway Race.
- July 4—Omaha, Neb., Speedway Race, Championship.
- July 4—Uniontown, Pa., Speedway Race.
- July 4—Tacoma, Wash., Speedway Race.
- July 4—Visalia, Cal., Road Race
- July 4—Spokane, Wash., Track Race.

- July 4—Benton Harbor, Mich., Track Race.
- July 14—Rochester, N. Y., Hill-climb.
- July 15—Missoula, Mont., Track Race.
- July 17-19—Buffalo, N. Y., Inter-city Reliability.
- July 22—Anaconda, Mont., Track Race.
- July 29—Great Falls, Mont., Track Race.
- Aug. 5—Billings, Mont., Track Race.
- Aug. 17—Flemington, N. J., Track Race.
- Sept. 3—Uniontown, Pa., Speedway Race.
- Sept. 3—Cincinnati, O., Speedway Race, Championship.
- Sept. 6—Red Bank, N. J., Track Race.
- Sept. 8—Hillclimb, Pike's Peak, for stripped stock chassis.
- Sept. 15—Providence, R. I., Speedway Race, Championship.
- Sept. 22—Allentown, Pa., Track Race.
- Sept. 28—Trenton, N. J., Track Race.
- Sept. 29—New York Speedway Race, Championship.
- Oct. 6—Danbury, Conn., Track Race.
- Oct. 6—Uniontown, Pa., Speedway Race.
- Oct. 13—Richmond, Va., Track Race.
- Oct. 13—Chicago Speedway Race, Championship.

- Oct. 27—New York Speedway Race.

**SHOWS**

- May 5-13—Chicago, Used Car Show, Coliseum, Chicago Automobile Trade Assn.
- June 20-27—Montreal, Que., Used Car Show, Coliseum, Montreal Automobile Trade Assn.
- Aug. 6-18—Fremont, Neb., General Tractor Demonstration.

- Sept. 2-9—Spokane, Wash., Interstate Fair.
- Sept. 9-15—Milwaukee Show, State Park Fair, West Allis.
- Sept. 9-15—Milwaukee, Wis., Fall Show, Wisconsin State Fair, West Allis, Milwaukee Automobile Dealers.
- Oct. 13-28—Dallas, Tex., Dallas Automobile & Accessory Dealers' Assn. State Fair.

## S. A. E. Calendar

**Midsummer Meeting**

- June 25-26—Washington, D. C.

**Standards Division Meetings**

- MAY**
- 4—Electric Vehicle, Hotel Statler, Cleveland.
  - 4—Marine Standards, Hotel Statler, Cleveland.
  - 16—Ball and Roller Bearing, New York.
  - 18—Truck Standards, New York.
  - 22—Lighting, Cleveland.
  - 25—Aeronautic, New York.
  - 25—Miscellaneous, Detroit.
  - 29—Research, New York.

- JUNE**
- 5—Starting Battery, Detroit.
  - 7—Engine, Detroit.
  - 8—Transmission, Detroit.
  - 14—Electric Vehicle, New York.
  - 18—Standards Committee.

**Section Meetings**

- MAY**
- 11—Detroit.
  - 17—Metropolitan, Engines that Will Burn the Fuels We Shall Have to Use. Papers by H. G. Chatain on the Diesel and P. O. Scott on the Junker.
  - 18—Cleveland, Some New Phases in the Case Hardening of Steel, by J. H. Heron.
  - 25—Indiana.

## Engineering Calendar

- American Railway Master Mechanics' Assn.
- American Institute of Electrical Engineers.
- Master Builders' Assn.
- American Society of Heating and Ventilating Engineers.
- Association Iron and Steel Electrical Engineers.
- Mining and Metallurgical Society of America.
- Society of Automobile Engineers.

**MAY**

- 5—Assn. Iron & Steel Elec. Engrs., Majestic Hotel, Philadelphia. Some Recent Applications of Electricity in the Steel Industry by G. E. Stoltz.
- 8—Soc. for Elec. Development annual meeting.
- 12—Assn. Iron & Steel Elec. Engrs. monthly meeting Cleveland section.
- 14—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mich. section at Detroit.
- 15—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mass. section at Boston.
- 17—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Penna. section at Phila.
- 17—Mining & Met. Soc. of Amer. monthly meeting New York section at Engrs. Club.
- 18—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ohio section at Cleveland.
- 19—Assn. Iron & Steel Elec. Engrs., Fort Pitt Hotel, Pittsburgh. Auspices of Power Committee, W. O. Oschmann, chairman. Power Cost Accounting Systems as Practised by Several Steel Mills in Pittsburgh District.
- 21—Amer. Soc. Heat. & Vent. Engrs. monthly meeting New York section.
- 21-24—Amer. Soc. Mech. Engrs. Spring meeting in Cincinnati. Joint session May 22 with Nat. Mach. Tool Bldrs. Assn.
- 29-June 1—Nat. Elec. Light Assn. Convention at Atlantic City.

**JUNE**

- 2—Assn. Iron & Steel Elec. Engrs. monthly meeting Phila. section.
- 5-7—Nat. Gas Engine Assn. annual meeting at Chicago (Sherman House).

- 8—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ohio section at Cleveland.
- 9—Assn. Iron & Steel Elec. Engrs. monthly meeting Cleveland section.
- 11—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ill. section at Chicago.
- 11—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Michigan section at Detroit.
- 12—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mass. section at Boston.
- 13-14-15—Amer. Ry. Master Mech. Assn. convention, Greek Temple, Atlantic City, N. J. Hdqrs. Marlborough-Blenheim Hotel.
- 14—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Penn. section at Phila.
- 15—Illum. Eng. Soc. Pittsburgh section, Office Building, Lighting and Inspection Trip through City and County Building. Mr. S. G. Hibben.
- 16—Assn. Iron & Steel Elec. Engrs. monthly meeting Pittsburgh section.
- 18-19-20—Master Car Bldrs. Assn. convention, Greek Temple, Atlantic City, N. J. Hdqrs. Marlborough-Blenheim Hotel.
- 20-22—Amer. Inst. Chem. Engrs., Ninth Semi-Annual Meeting at Buffalo.
- 21—Mining & Met. Soc. of Amer. New York section monthly meeting at Engrs. Club.
- 26-30—Amer. Soc. for Test Mat. annual meeting Atlantic City.

**JULY**

- 7—Assn. Iron & Steel Elec. Engrs. monthly meeting Phila. section.
- 9—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ill. section at Chicago.
- 9—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mich. section at Detroit.

- Illuminating Engineering Society.
- National Electric Light Assn.
- National Gas Engine Assn.
- American Society for Testing Materials.
- American Institute of Metals.
- American Foundrymen's Assn.
- Society Naval Architects and Marine Engineers.

- 10—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mass. section at Boston.
- 12—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Penn. section at Phila.
- 13—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ohio section at Cleveland.
- 14—Assn. Iron & Steel Elec. Engrs. monthly meeting Cleveland section.
- 16—Amer. Soc. Heat. & Vent. Engrs. monthly meeting New York section.
- 21—Assn. Iron & Steel Elec. Engrs. monthly meeting Pittsburgh section.

**AUGUST**

- 4—Assn. Iron & Steel Elec. Engrs. monthly meeting Phila. section.
- 9—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Penn. section at Phila.
- 10—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ohio section at Cleveland.
- 11—Assn. Iron & Steel Elec. Engrs. monthly meeting Cleveland section.
- 13—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ill. section at Chicago.
- 13—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mich. section at Detroit.
- 14—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mass. section at Boston.
- 20—Amer. Soc. Heat. & Vent. Engrs. monthly meeting New York section.
- 21—Assn. Iron & Steel Elec. Engrs. monthly meeting Pittsburgh section.

**SEPTEMBER**

- 1—Assn. Iron & Steel Elec. Engrs. monthly meeting Phila. section.
- 8—Assn. Iron & Steel Elec. Engrs. monthly meeting Cleveland section.

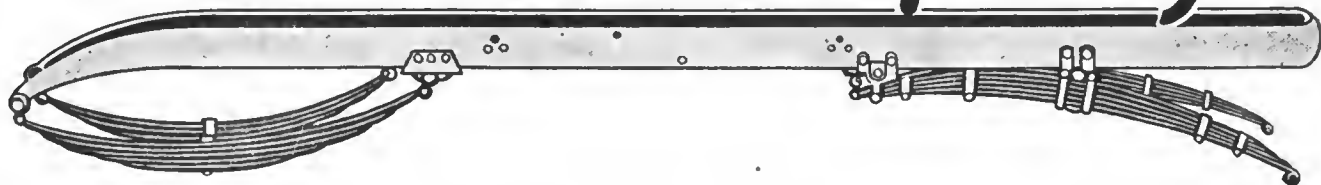
- 10-14—Assn. Iron & Steel Elec. Engrs. annual convention at Phila.
- 10—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ill. section at Chicago.
- 10—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mich. section at Detroit.
- 11—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mass. section at Boston.
- 13—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Penn. section at Phila.
- 14—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ohio section at Cleveland.
- 15—Assn. Iron & Steel Elec. Engrs. monthly meeting Pittsburgh section.
- 17—Amer. Soc. Heat. & Vent. Engrs. monthly meeting New York section.
- 20—Mining & Met. Soc. of Amer. monthly meeting N. Y. section at Engrs. Club.
- 24—Amer. Inst. Metals at Boston.
- 24—Amer. Fdry. Assn. annual meeting at Boston.

**OCTOBER**

- 6—Assn. Iron & Steel Elec. Engrs. monthly meeting Phila. section.
- 8—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ill. section at Chicago.
- 9—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mich. section at Detroit.
- 10—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mass. section at Boston.
- 11—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Penn. section at Phila.
- 13—Assn. Iron & Steel Elec. Engrs. monthly meeting Cleveland section.
- 15—Amer. Soc. Heat. & Vent. Engrs. monthly meeting New York section.
- 17, 18, 19—Amer. Gas. Inst. at Washington, D. C.



# You Ride on the Springs



**EVERY** car is equipped with springs in order to make it ride easily, but if these springs are not kept lubricated so you get spring action they are absolutely useless—you might as well have a solid piece of steel.

Heretofore the lubricating of springs has been a tedious, irksome task—but it need be no longer if you will use

## JOHNSON'S STOP-SQUEAK OIL

It is very easy to apply—you don't need a tool of any kind—it isn't even necessary to jack up the car—simply paint it on with a brush or squirt it on with an oil can.

It is a simple remedy for hard riding cars. Applied to the side of springs—it will quickly penetrate between the leaves driving out the rust and lubricating them thoroughly.

### *It Penetrates*

Johnson's Stop-Squeak Oil has the remarkable property of seeping rapidly between the spring leaves and to the furthestmost wearing points and it there becomes a heavy bodied lubricant, allowing perfect spring action.

### *Make Your Car Ride Easily*

Instead of bumping over the road you can fairly float along if your springs are lubricated so you have spring action. If spring leaves are rusted together you might as well be riding on a solid piece of steel.

### *For Squeaks of All Kinds*

Johnson's Stop-Squeak Oil removes squeaks of all kinds—in springs—shackle bolts—body—fenders—top, etc. It also reduces the liability of spring breakage.

Insist upon your dealer supplying you with Johnson's Stop-Squeak Oil. If he cannot do so use attached coupon.

**S. C. JOHNSON & SON**

Dept. A, Racine, Wis.

Enclosed please find \$1.00 for which please send me by pre-paid express, one quart of Johnson's Stop-Squeak Oil—enough for a season's use.

Name .....

Address .....

City & State .....

My Dealer is .....

Please mention The Automobile when writing to Advertisers

## War Time Economy

Rayfields are saving millions yearly through Economy of Gasoline.

With all its records for Speedway, Highway and Airway, the greatest accomplishment of the Rayfield is its positive economy—a fact so well assured that any Rayfield dealer or service station will sell you a

# RAYFIELD

## CARBURETOR

Unconditionally guaranteed to give more mileage per gallon of gasoline and to satisfy you in every other way.

Car owners will realize the vast importance of this fact at such a time, when the nation is setting itself to practice *sensible* economy. *Add* to economy the fact that your car will be vastly more flexible, more powerful, and speedier.

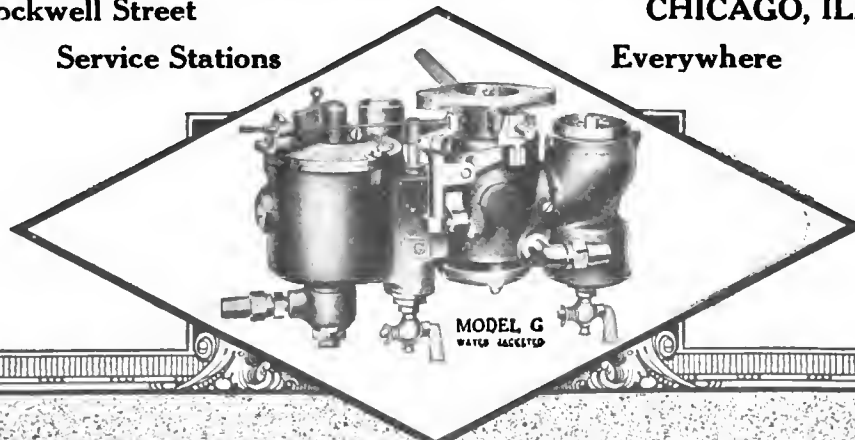
**Findeisen & Kropf Manufacturing Co.**

2117 Rockwell Street

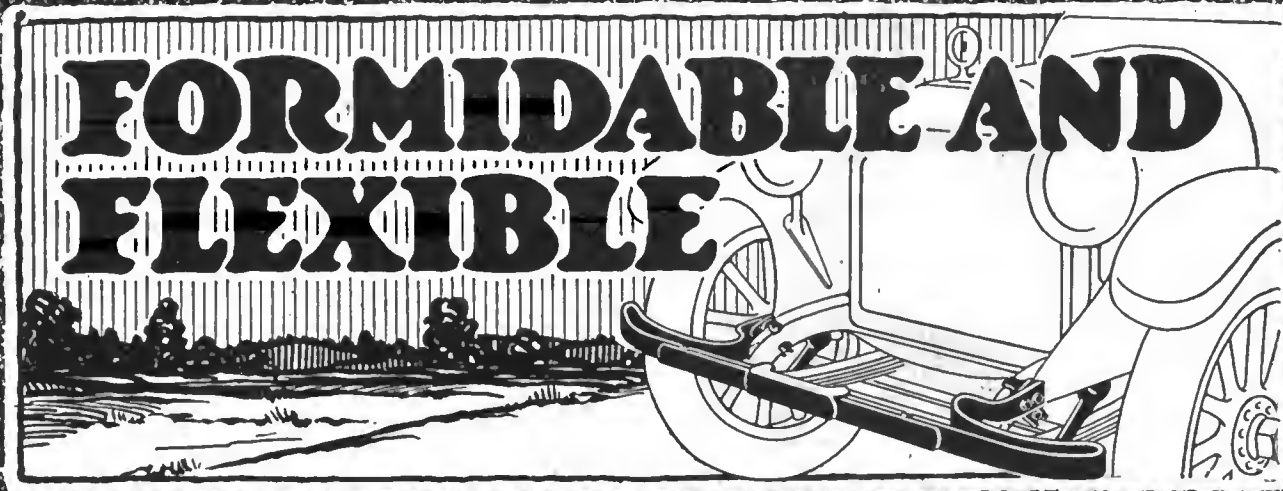
CHICAGO, ILLINOIS

Service Stations

Everywhere



Please mention The Automobile when writing to Advertisers



The "bumper" which presents a *rigid* front to the colliding object either bends or breaks beneath the blow, or transmits the strain to the car.

Of *flexible* construction, the

# Hartford

## BUMP ABSORBER

—more than a Bumper

gives before the blow and, while giving, assimilates and dissipates the force of it by means of two powerful double-loops of spring-steel. It matters not from what direction the blow comes, as the Hartford Bump Absorber is built to give protection from tip to tip.

The Hartford Bump Absorber affords real protection. Moreover, it improves the appearance of any car.

Bolts on without drilling and stays bolted.

IT SMOTHERS THE BLOW

**THREE MODELS**  
 Large Car Type (three leaf) . . \$12    Medium Car Type (two leaf) . . \$10    Ford Car Type . . . . . \$8

Standard finish, black enamel with nickel center clamp. Nickel finish \$1 additional. Brackets available for attachment to cars with splash pans without cutting pans or drilling frames.

### EDWARD V. HARTFORD, Inc.

Heretofore known as

Hartford Suspension Co., 144 Morgan Street, Jersey City, N. J.

Makers of the Hartford Shock Absorber, E. V. Hartford Electric Brake, Hartford Auto Jack, Hartford Bump Absorber

Branches: New York, 1846 Broadway, and Service Station, 1926 Broadway; Boston, 319-325 Columbus Avenue; Chicago, 2637 Michigan Avenue

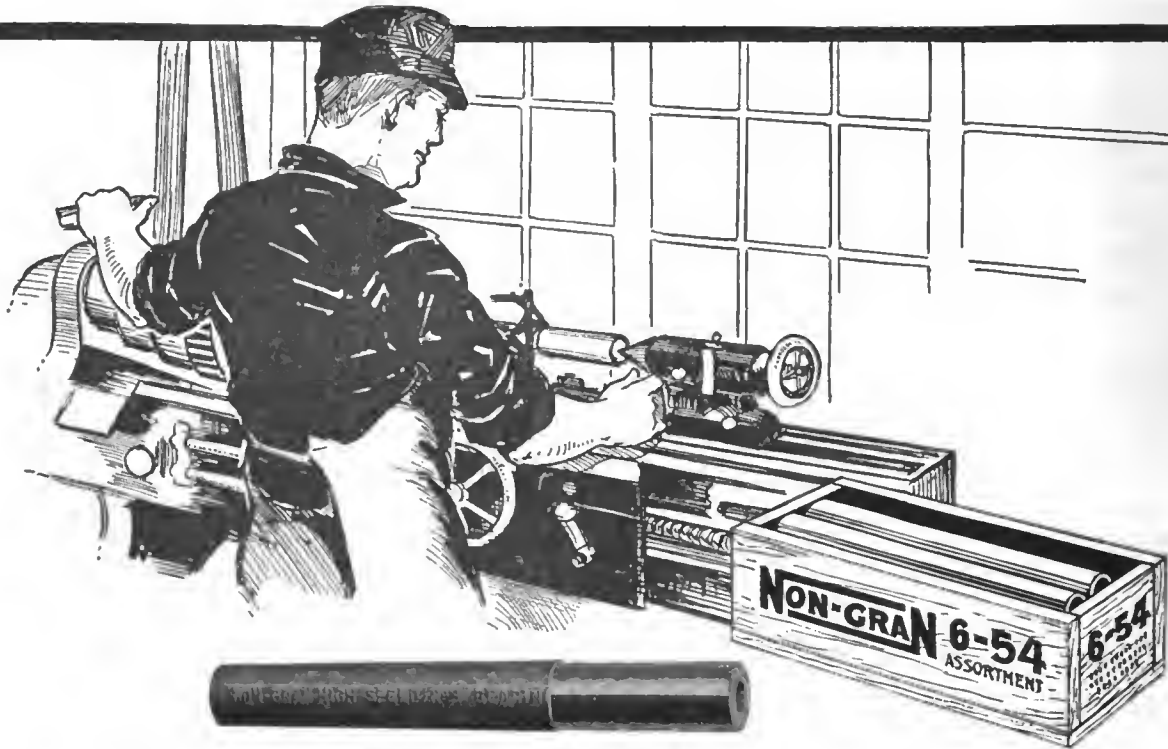
Distributors in principal cities. Dealers everywhere.



Hartford Shock Absorber Makes Every Road a Boulevard



Hartford Auto Jack The Best Jack Money Can Buy



# The Importance of Good Bushings

The bushings are subjected to greater wear than any other parts of a car.

Rattles, knocks, vibrations, and power loss are caused by worn bushings.

Play in the bushings is the cause of most motor car troubles.

When bushings show wear, they cannot be adjusted. They must be renewed. This means you have to tear your car all to pieces, just to get at them.

Consequently no part of a car is the cause of more overhauling expense.

Builders of quality cars use only the finest quality bushings — if they

didn't, their cars would not be quality cars.

Quality in the bushings is vitally important. In no other way can frequent overhauling expense be avoided.

NON-GRAN bushings are the world's acknowledged **QUALITY** bushings. Ten years' performance on America's quality-built cars has proven NON-GRAN superiority beyond any question of doubt.

NON-GRAN cost more, but builders of quality cars willingly pay the extra cost because they **KNOW** it will add to the service life of their

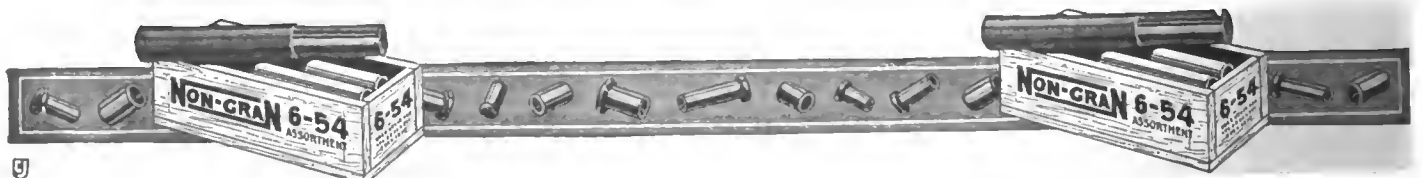
cars and greatly reduce overhauling expenses to the owner.

Almost any repairman can replace any worn bushings in your car with NON-GRAN **QUALITY** bushings.

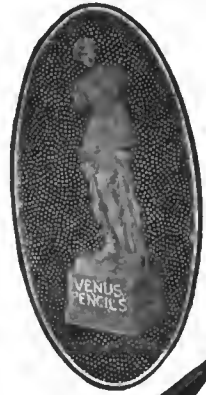
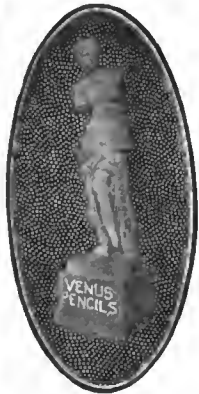
Thousands of good repairmen carry in stock an assortment of NON-GRAN cored bars from which they make their bushings. Repairmen have no trouble in getting NON-GRAN cored bars, for they are for sale by every good jobber in the land.

**American Bronze Company**  
Derwyn • • • Pennsylvania

HIGH SPEED  
**NON-GRAN**  
BEARING BRONZE



Please mention The Automobile when writing to Advertisers



# VENUS 10¢ PENCIL FREE!

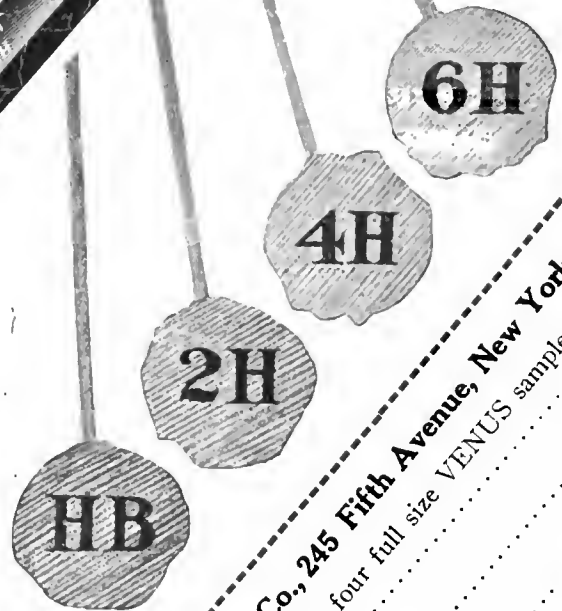
So that you may appreciate, (as thousands of mechanical, electrical and civil engineers now do,) the perfection of the 17 black degrees of VENUS perfect pencils, which range from 6B softest to 9H hardest, we shall send *free*, full length 7" VENUS pencils in 4 degrees indicated, or any four degrees you may prefer. For uniformity, smoothness, durability, and adaptability for every purpose, these pencils are unequalled.

Look for the watermark finish.

**Fill out and mail this coupon now!**

**American Lead Pencil Co.**  
245 Fifth Ave., NEW YORK CITY

NOTE—This offer expires June 1, and is intended particularly for designers, draftsmen and engineers in the automobile industry.



**American Lead Pencil Co., 245 Fifth Avenue, New York**

Please send me free for test four full size VENUS samples.  
I prefer these 4 degrees:

Name.....  
Position.....  
Company.....  
Address.....





## Give your car a rubdown with Pimbley's Auto Newer

*"Cleans and news any exterior finish"*

Hear folks say, "Ah, a new car, eh?"

Pimbley's Auto Newer revives and restores the natural, beautiful original finish of your car—makes it look like new. A few drops on cheese cloth, a few brisk rubs, and lo! the car looks NEW!

Why obscure the beautiful, original finish of your car with heavy oils, wax, paste or so-called "polishes"? You can retain, revive and renew the body-maker's ORIGINAL finish with Pimbley's Auto Newer. *Something different.* If not at your dealer's write us; 50c and \$1.00.

## Pimbley's Auto-Top-Newer

Not a paint, but a black liquid compound used with a brush that tones up the top and makes it look like new. Dries quickly; won't rub off. Waterproof. Fine for seats, cushions, leather trimmings—trunks and suit-cases. Also used on under parts of car, such as axles, running-board, etc. Price 50c, \$1.00 and \$1.50. At all dealers and garages. If not at yours, order direct.

**Dealers!** Link up with our National Advertising Campaign now carried on in Saturday Evening Post and leading auto publications. Our special dealer proposition will interest you. Get it.

**Pimbley Paint & Glass Co.**  
St. Joseph, Missouri

Please mention The Automobile when writing to Advertisers

# Make Your Store The Auto Supply Headquarters Of Your Town!!

There are a thousand chances for garage men and repairmen to sell spot-lights, seat covers, shock absorbers, spark plugs, etc. All you have to do is to *stock* auto supplies, *display* them, *talk* them to auto owners. And there will be over four million motorists in the United States this year.

The Service Motor Supply Co. of Chicago *stands ready* to show you how to make big profits catering to the *thousand and one needs* of auto owners. We will help you at *every stage of the game*. We will be your *Chicago partner* and make it easy for you to win out, just as we have helped 34,000 other dealers.

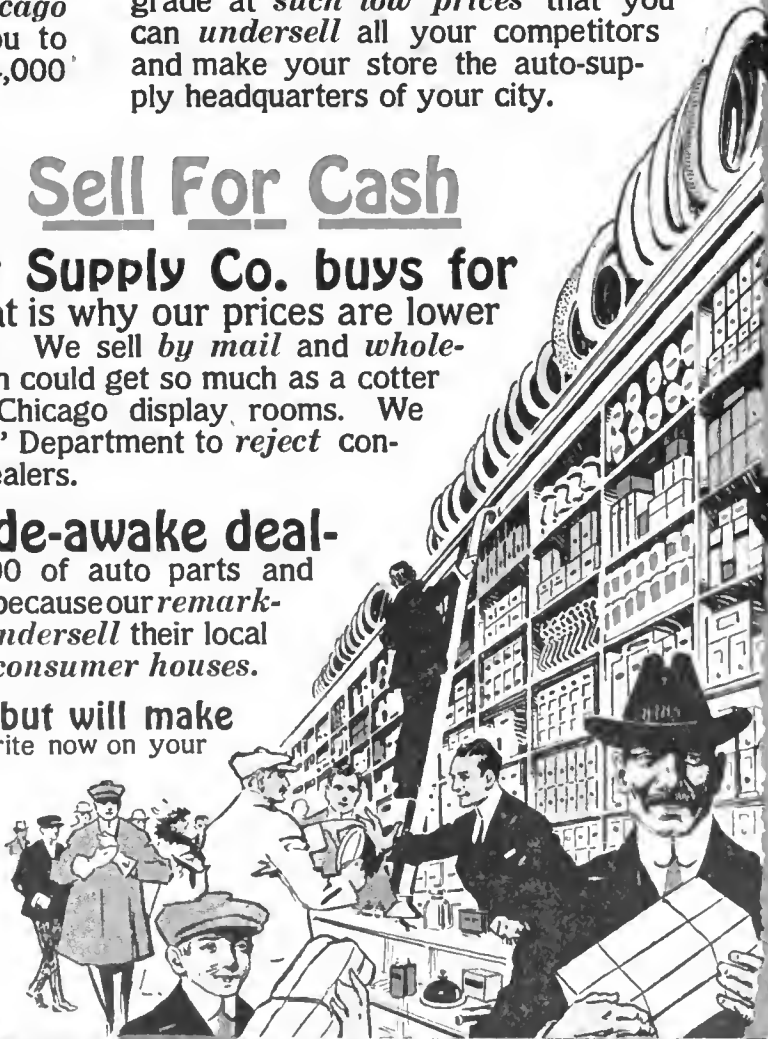
Write for "SNAPS." It is the "National Bargain Directory of Auto Supplies." We send you a new issue of "SNAPS" on the first of every month. It lists hundreds of items—quick-selling merchandise of the best grade at *such low prices* that you can *undersell* all your competitors and make your store the auto-supply headquarters of your city.

## We Buy and Sell For Cash

The Service Motor Supply Co. buys for cash and sells for cash—that is why our prices are lower than you can get anywhere else. We sell *by mail and wholesale only*. No man in your town could get so much as a cotter pin from us by mail or in our Chicago display rooms. We employ fifty people in our "T. D." Department to *reject* consumer orders and *protect* our dealers.

Over 34,000 live wide-awake dealers are buying over \$5,000,000 of auto parts and accessories from "SNAPS" yearly because our *remarkably low prices* allow them to *undersell* their local competitors and *mail-order-to-consumer houses*.

"SNAPS" cost you nothing but will make new and bigger profits for you. Write now on your letterhead—so we can know you are a legitimate dealer, or send in your business card and we will see that your copy of "SNAPS" reaches you in a hurry. Write today.



**SERVICE MOTOR SUPPLY CO. 1523-25-27-29-31 MICHIGAN AVE. CHICAGO, U.S.A.**

HESS-BRIGHT'S CONRAD PATENTS ARE THOROUGHLY ADJUDICATED



# HESS-BRIGHT BALL BEARINGS

Inspire confidence wherever known. *They bear the load efficiently.* The quality of HESS-BRIGHT BALL BEARINGS represents the built-in-intention of the world's best bearing makers.

**THE HESS-BRIGHT MANUFACTURING COMPANY**  
**PHILADELPHIA, PA.**

Hess-Bright Distributors for Retail Trade in Every City of Importance

Please mention The Automobile when writing to Advertisers



## *Announcement!*

**Duesenberg Motors Corporation has been organized to manufacture Automobile, Marine and Aeroplane Motors for those who can afford and demand the best**

**E**ACH of the three types of motors will be built on the same general design, differing only enough to adapt them to their individual requirements. The Duesenberg Design has proven itself in actual service for a number of years.

More than 60% of all racing cars on American Speedways in 1915 were equipt with Duesenberg Motors.

Duesenberg Motors were installed in the first motor boat to make a mile-a-minute speed.

Duesenberg Motors were installed in the boat that won the Displacement Runabout Classic at the Miami Regatta this year.

Duesenberg Motors are installed in Seaplanes now in the Service of the United States Navy.

The Duesenberg Four and Six Cylinder Automobile Motors typify the evolution of the

Duesenberg Design which has passed through the severe test of automobile and motor boat racing and now occupies a dominant position in the field of internal combustion engine design.

The Duesenberg Design as applied to Automobile Motors has been worked out in full detail and put on a commercial and manufacturing basis. The business policy of the Duesenberg Motors Corporation lends itself only to production on a limited quantity basis. Inquiries are invited from those manufacturers whose clientele demands high efficiency and performance. Our large plant at Edgewater, N. J., is now manufacturing both four and six cylinder Duesenberg Automobile motors. You are cordially invited to get in touch with our New York Office.

**DUESENBERG MOTORS CORPORATION**

**120 BROADWAY, NEW YORK CITY**

**Factories at Chicago, Ill., and Edgewater, N. J.**

# Celfor

## Internal Gear Drive Axle

### TWELVE TALKS TO ENGINEERS

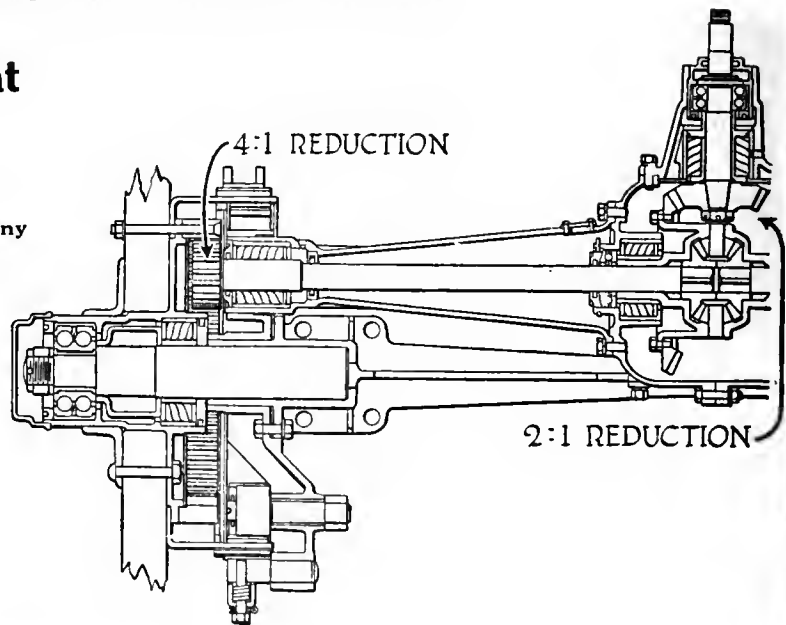
#### *Talk No. 8—Torque Set Up at Wheels*

The internal gear drive axle causes the driving torque to be set up at the wheels, not at the center of the axle. Thus there is no tendency to tip the axle up or down at the center, due to the reaction to the driving torque. There being no such tendency, the axle does not have to be designed to resist this tipping tendency. Thus an internal gear drive axle is the simplest axle made, in principle, except the chain drive. You know that the chain drive is hopelessly antiquated, but if you equip your trucks with internal gear drive axles you get the advantages of the chain drive as well as the advantages of the shaft drive.

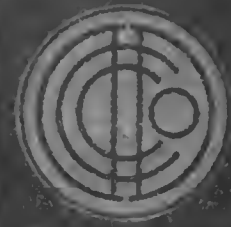
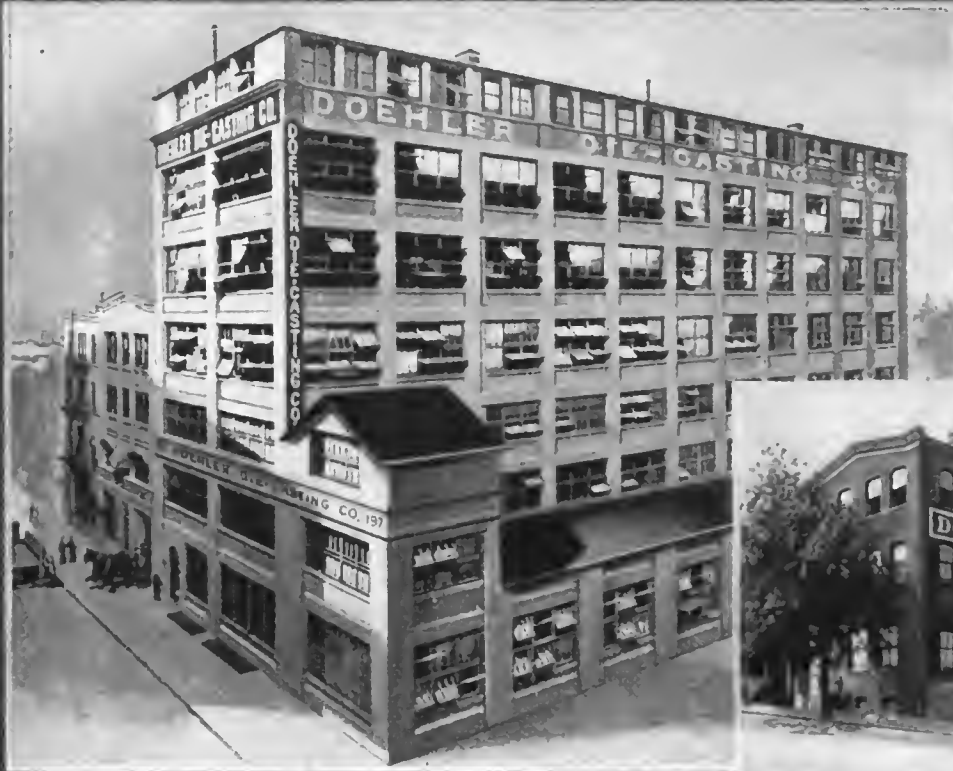
This is one of a series of twelve engineering arguments. If you would like to have the whole set at once, write to the

### Clark Equipment Company

Successors to  
Celfor Tool Company and  
Buchanan Electric Steel Company  
Buchanan, Michigan



Please mention The Automobile when writing to Advertisers



The combined area of these three plants aggregates the largest floor space in the world devoted to the exclusive manufacture of Die-Castings.

# DOEHLER DIE-CASTING CO.

MAIN OFFICE AND EASTERN PLANT  
**BROOKLYN, N.Y.**

WESTERN PLANT  
**TOLEDO, OHIO.**

NEW JERSEY PLANT  
**NEWARK, N. J.**

SALES OFFICES

CHICAGO  
4414 NO. CAMPBELL AVE.

DETROIT  
914 FORD BUILDING

ROCHESTER  
726 GRANITE BUILDING

BOSTON  
723 OLIVER BUILDING

Please mention The Automobile when writing to Advertisers

**Crane**  
PATENTED

**\$8**

## The PEAK of Power-Pump Performance

The \$8 CRANE inflates a 34x4 tire to 80 pounds in 4 minutes time. No pump of twice the CRANE'S size and price can do more. And no same-size pump can do as much.

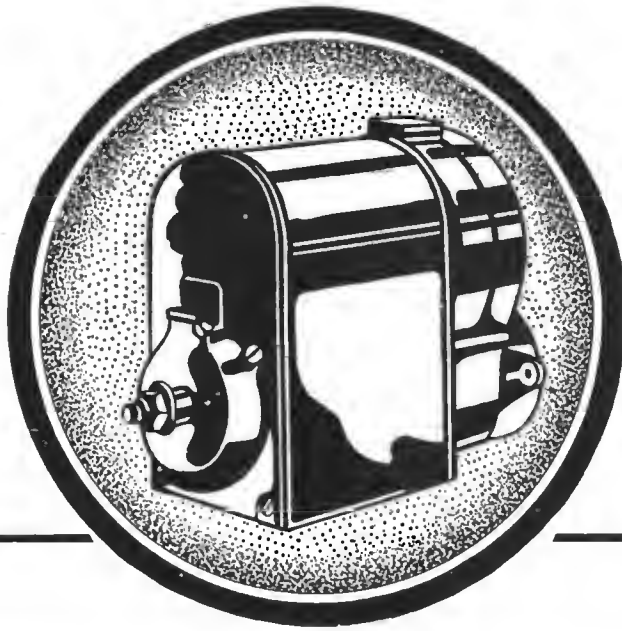
For the CRANE has a patented packing ring. That makes it 97% efficient—instead of the usual 57%.

The pump that nine out of every ten motorists want ought to make some easy money for you.

*Order through your jobber or write us.*

**BAY STATE PUMP COMPANY**  
100 PURCHASE STREET BOSTON

106



# Who Got the Jump in Magneto Making?

The first strictly high-tension Magneto was an Eisemann. It was designed and built sixteen years ago.

The lead which the EISEMANN assumed then never has been relinquished.

Judge how firmly this Magneto has held its leadership, by the quality of the Motor Trucks whose makers use the EISEMANN as standard equipment. The list of 69 includes

Federal  
G. M. C.  
Gramm-Bernstein

Kelly  
Pierce-Arrow

Service  
Sterling  
White

Truck Service, better than anything else, reveals the difference between Magnetos. Eisemann superiority in the pleasure-car field is just as positive and as clearly demonstrable.

## THE EISEMANN MAGNETO CO.

Sales and General Offices: 32-33rd St., Brooklyn, N. Y.

Chicago, Ill., 910 South Michigan Ave.

Detroit, Mich., 802 Woodward Ave.

# EISEMANN

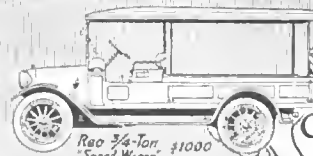
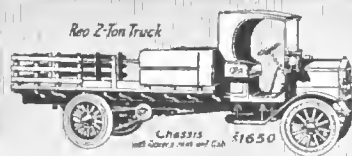
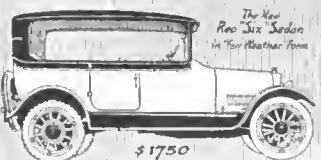
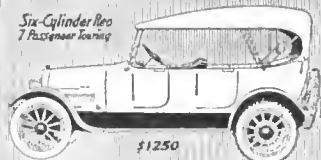
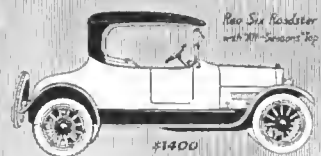
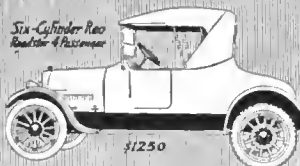
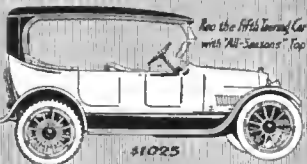
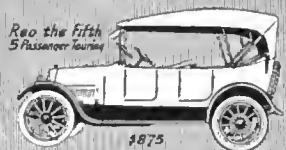
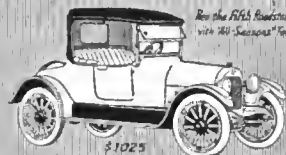
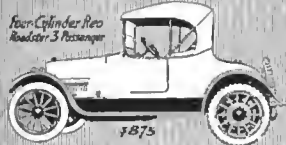
MAGNETO

Please mention The Automobile when writing to Advertisers





# Swamped— Deluged!



"THE  
GOLD STANDARD  
OF VALUES"

All Prices are f.o.b. Lansing, Michigan, and are Subject to Increase Without Notice

THAT'S THE CONDITION of the Reo Sales Department at this moment.

MORE THAN 9000 orders on file in excess of possible factory output.

EVERY YEAR since the inception of Reo, the demand has been greatly in excess of the supply.

NEVER SINCE THE DAY the first Reo left the factory has it been possible to supply all who wanted Reos. Never a day!

BUT THIS YEAR it is almost hopelessly so. For motor trucks as well as for automobiles—sixes as well as fours.

ISN'T THAT THE KIND of line you like to handle—the kind that sells itself?

OH YES! OF COURSE IT IS a little aggravating at times to have more orders that you can fill. But it's a lot more aggravating to have cars on the sales floor that you can't move—cars that nobody wants and that you can move only by bad trade-ins or price cutting.

JUST REMEMBER this condition next season when planning for the future and selecting the line that you want to handle—permanently.

IT MAY NOT BE possible to get the Reo line—depends where you are located and how satisfactorily we are represented there now.

BUT THE WISE DEALER keeps his eyes open and his ear to the ground—you never can tell!

**Reo Motor Car Company**  
Lansing, Michigan

185

Please mention The Automobile when writing to Advertisers

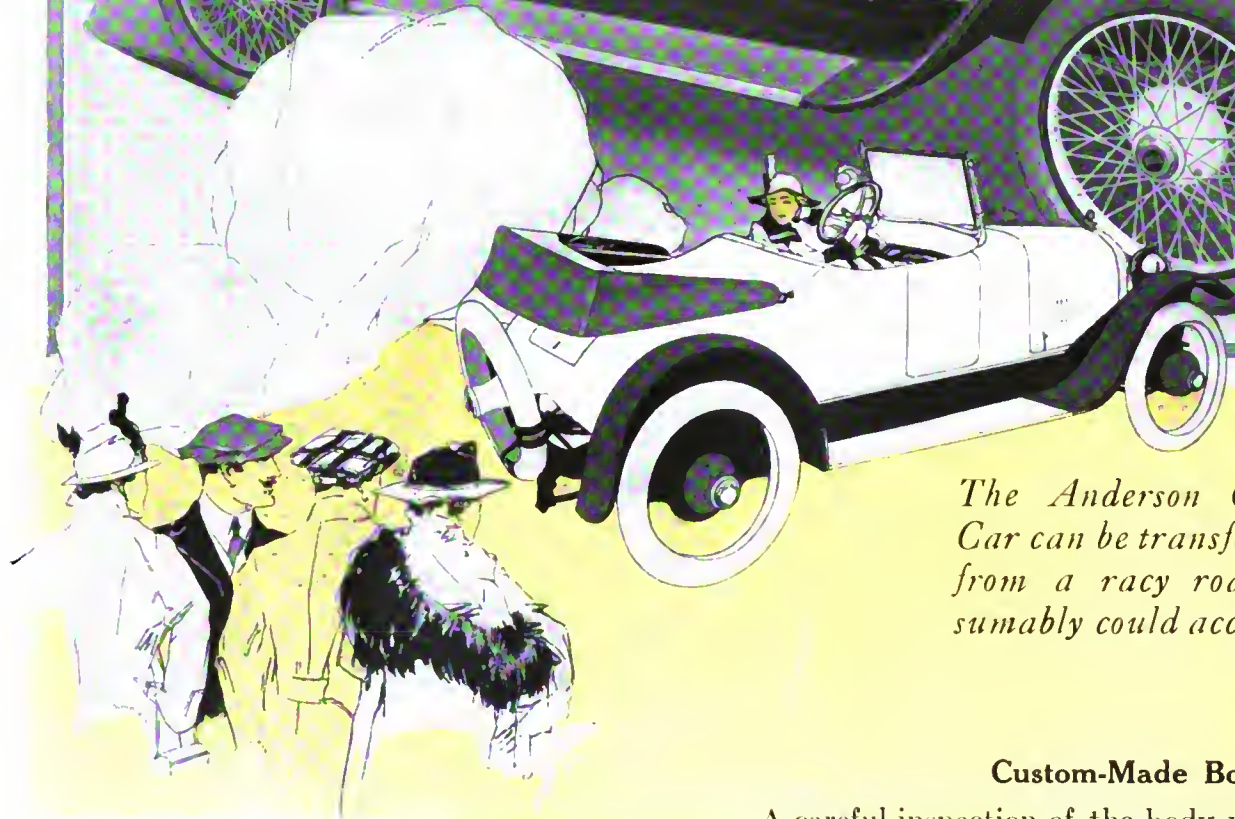
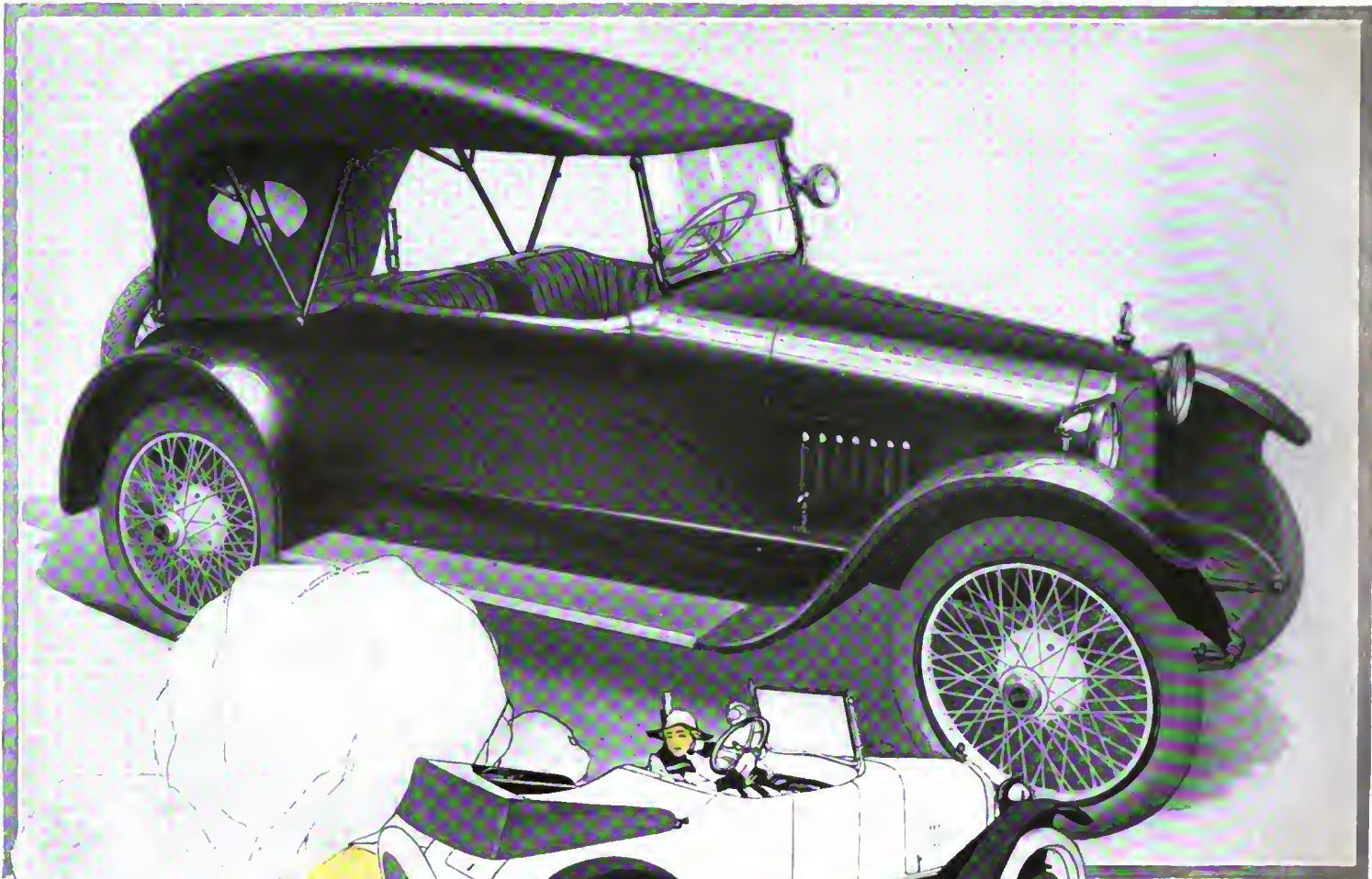


*Five-Passenger Touring Model*

## A NEW LUXURY CAR AT THE RIGHT PRICE

Distinctive custom-made bodies of exclusive and original design,  
—luxuriously finished and upholstered in real leather,  
—completely equipped with every accessory that will add to pleasure or comfort,  
—a perfect chassis, built entirely of well-known mechanical units of established excellence,  
—light in weight, perfectly balanced, economical of operation, and conservative in price,  
that, briefly, is a description of the ANDERSON "Six."

# ANDERSON SIX



*The Anderson Convertible Sport Car can be transformed in a moment from a racy roadster, which presumably could accommodate but two,*

### Custom-Made Bodies

A careful inspection of the body work of an Anderson will reveal workmanship of a quality you would scarcely expect to find in cars selling for less than \$2,500 or \$3,000.

It is in body styles, in luxurious finish and riding comfort that Anderson cars truly excel.

Each Anderson body is custom made—built, upholstered and finished in our own big body plant.

For 28 years we have specialized in the production of the finest grades of coach work. With our special body-building knowledge, unexcelled facilities, experienced labor, and with materials close at hand, we are able to equip all Anderson cars with these custom-built bodies without extra charge.

The finish is hand applied and hand rubbed, 21 different operations in all, insuring a lasting lustre such as is given only the finest custom-made bodies.

The upholstery is alluringly deep and wide and skillfully tailored in real leather. Only the finest of curled hair is used. The seats are properly tilted and shaped to insure luxurious riding. For comfort and smartness of design and finish, the Anderson is a distinct innovation.

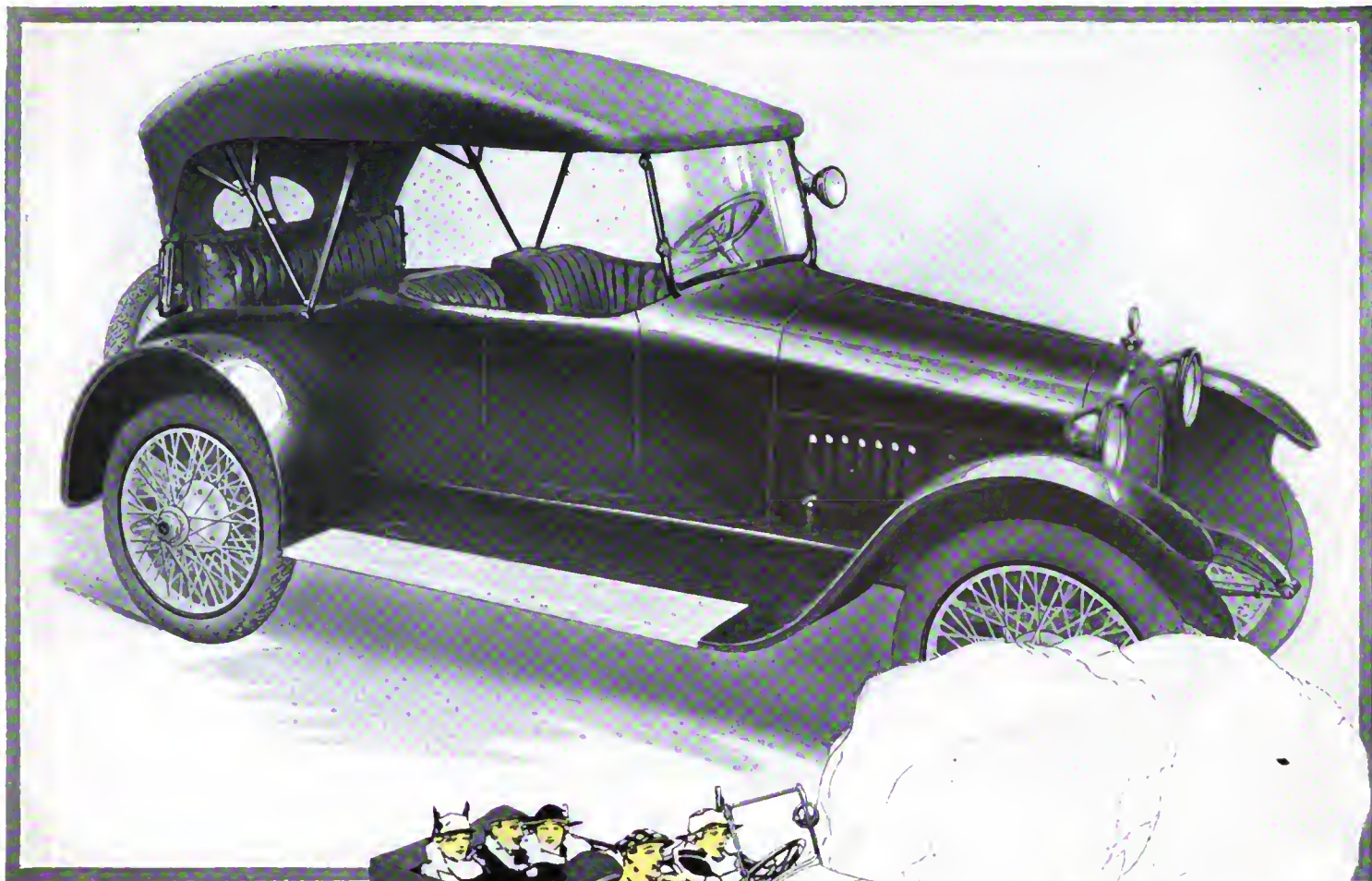
In a motor car built entirely of mechanical units whose reputation for excellence has been firmly established by performance, greater perfection can be achieved only through refinement of minor details and through superior design, construction and finish of the body work.

The mechanical units incorporated in the ANDERSON "Six" are universally recognized as of the finest.

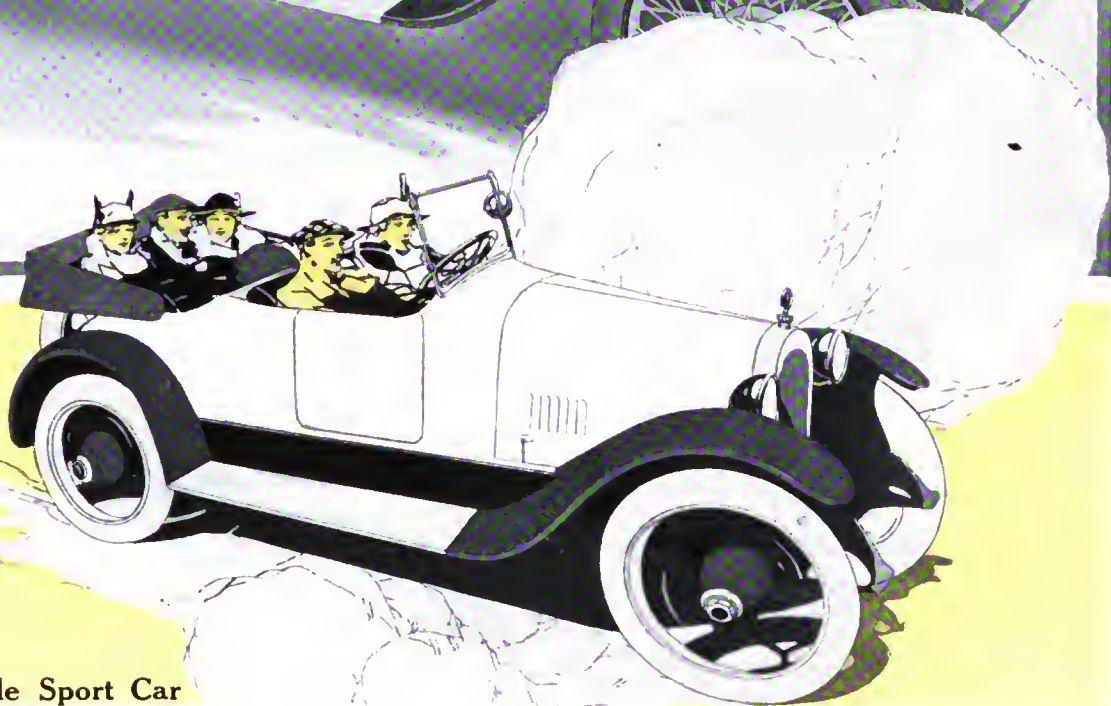
It is a car that will render excellent service. It is light in weight and perfectly balanced. The spring suspension is ideal. It is easy on tires. It is economical of fuel.

Its frame is extra strong and double braced. It cannot twist or weave.

It is powerful. It is CONTINENTAL equipped, six cylinders. It has WESTINGHOUSE electrical equipment and a ZENITH carburetor. It will travel from 2 to 60 miles per hour on high. It is flexible. It is easily handled in traffic. It has an abundance of reserve power for the hills.



*—into a luxurious,  
roomy touring car  
with ample seating  
capacity for five.*



**Convertible Sport Car**  
(Patents Applied For)

Of all the innovations in body styles which have recently been placed on the market, the ANDERSON Convertible Sport Type unquestionably ranks as the greatest achievement of all, for it combines distinct originality of design with real utility and complete comfort.

It solves the problem of the many motorists who want both a touring car and a roadster—for the cost of a single car.

When not in use the rear seat of this convertible sport car is completely covered and so cleverly concealed you would never suspect its existence. You can see only the straight stream lines of a racy roadster. Yet at a moment's notice the operator can disclose a big roomy rear compartment containing a seat sufficiently large ( $47\frac{1}{2}$  inches wide) to seat three people comfortably.

When open, this rear compartment is fully as large as the rear compartment of the average touring car.

It is far more than a mere emergency seat of the cramped, shin scraping variety. There is plenty of room for feet and knees, just as there is plenty of room for shoulders and arms. Both in appearance and comfort it is a real five passenger touring car.

### Detail Refinements

All Anderson models are built on the same chassis and all have the same equipment.

From the oval-shaped radiator to the concealed luggage compartment in the rear you will find many extra features that will add to the pleasure and comfort of motoring.

There is a full size BOYCE Motometer.

There is an engine-driven tire pump—a KELLOG.

There is a KLAXON Horn, motor-driven.

The wind shield is rakishly slanted. Beneath it is a finely grained solid walnut instrument board completely equipped with control switches, head light dimmer, STEWART Speedometer, Ammeter and gasoline gauge.

# ANDERSON SIX

*Detail refinements—continued.*

There is a spot light, with mirror.

There is a heater of the foot rest type in the tonneau.

Overhead is a special designed Anderson One-Man Top, covered with De Lux RAYNTITE material. Snugly concealed within the top are the storm curtains which can be quickly attached from the inside, when occasion demands.

A concealed built-in luggage compartment in the rear contains ample storage space for spare tubes, tools, chains and other motoring requisites quickly accessible without disturbing the other occupants of the car.

Not a single accessory that would add to comfort or pleasure has been omitted.

## Why the Anderson Six will prove profitable for the best dealers

- 1 Because it is designed and built right—certain to render a very high percentage of motoring satisfaction to the class of buyers who are able to recognize real *character* in construction and finish.
- 2 Because the Anderson Convertible Sport Car is unquestionably the nearest approach to a perfect embodiment of the type of car for which there is the greatest and most constant demand at the present time.
- 3 Because we are able *right now* to make shipment on orders—whether it be carload or trainload.
- 4 Because the organization behind is efficient and financially sound to the core.

The Anderson Six will prove a big asset to every dealer who is a live merchandiser, and who is building for the future.

Our factory distributing bases will be located in the centers of principal territorial zones. Each base will have facilities to aid every dealer—in fact the service will be as complete as though an Anderson factory were located in every zone.

Back of the Anderson Six are 28 years of manufacturing experience and reputation, and the accumulated facilities and resources of 28 years of progress and growth. For almost a third of a century J. G. Anderson has ranked as one of the world's largest high-grade carriage builders.

The management of the company is under the direction of well-known business men of established reputations and high ideals—the production, sales and engineering is in the hands of widely known and highly experienced automobile men.

The financial resources and responsibility of the company are of the highest.

Our Selling Plan and our Dealer Proposition are of unusual interest. We want every dealer who is in position to consider a character product such as ours to write or wire us *at once!*

Of course there can be only one dealer in each territory!

**ANDERSON MOTOR COMPANY**  
Rock Hill, South Carolina

## SPECIFICATIONS

**Bodies**—Custom built, by Anderson. Body Frames of dry seasoned oak and ash, sawed to shape, counter braced, covered with hammer-shaped steel panels, free from metallic rattles; finish, hand applied and hand rubbed. Colors: Grey, Blue, Light Green or Deep Green. Special colors, \$34.00 extra.

**Motor**—Anderson, Continental built, high speed, 6 cyl., 3¼ x 4½, cast en bloc 40 h. p.

**Carburetor**—Zenith.

**Clutch**—Borg and Beck, dry disc type. Ten-inch diameter.

**Wheel Base**—120 inches.

**Springs**—Front, 2" x 36", 7 leaves. Rear, 2" x 56", 9 leaves. Underslung. Semi-elliptic, flat type. Chrome Vanadium Steel. Eight inch spring play.

**Axles**—Front, I-beams drop forged, one piece. Rear, full floating, heavy pressed steel housing, spiral bevel differential gears.

**Tires**—33 x 4 oversized.

**Electrical Equipment**—Westinghouse, two unit, six volt starting and lighting, battery type ignition. Willard Battery. Ammeter. Dimmer switch. Armored cable used throughout.

**Lubrication**—Constant level, forced feed and splash.

**Weight**—2750 pounds.

### Standard Equipment Includes

Gasoline gauge. Foot rest heater for winter use. Kellog engine-driven tire pump. Klaxon motor-driven horn. Spot light and trouble lamp. Quick demountable rims, One-man top. Ventilating windshield, tilted, clear vision. Stewart Speedometer. Repair kit, complete set of tools and other usual equipment.

### Prices

Convertible Sport Car.....\$1,295  
Five-Passenger Touring Car..... 1,295  
(with divided front seats)  
Five-Passenger Touring Car..... 1,295  
(with straight front seat)

*Houk Wire Wheels, \$100 extra*

Please mention The Automobile when writing to Advertisers

11

**T**HE average motor car in private use is lucky if it gets overhauled once a year. But how much better it would run could it but have the twenty-six thorough inspections and overhauls which are received, one every fortnight, by every

## *Fifth Avenue Bus*

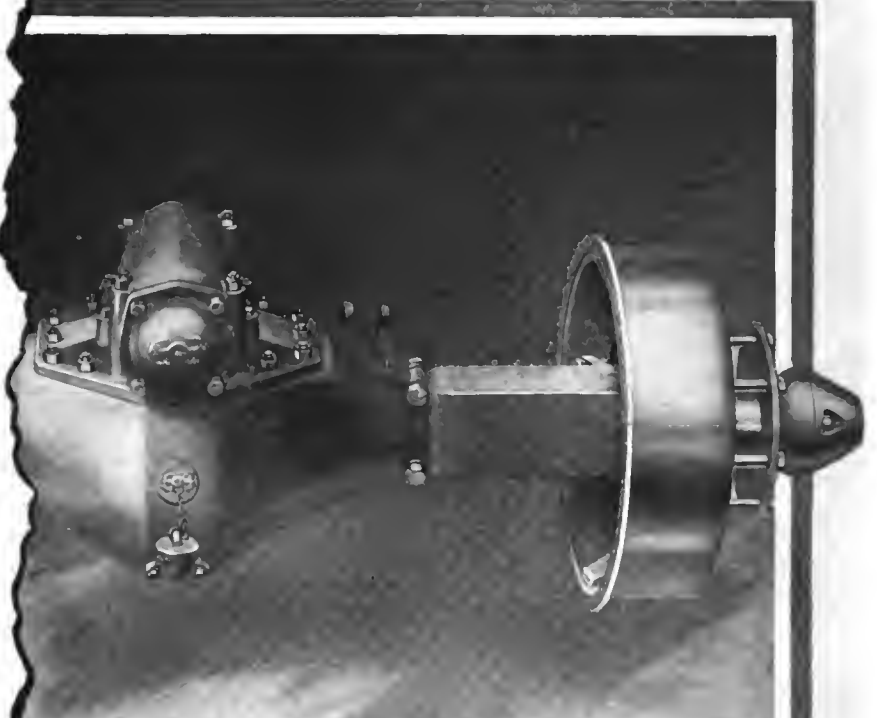
on  
April  
17th  
1

**T**HIS IS THE DISCOVERY of the Fifth Avenue Coach Company after three years' thorough test of every type of axle and drive available. As the result of this test they have decided to use Sheldon Worm Drive Rear Axles exclusively in the future.

Sheldon Worm Gear Rear Axles are superior from the operating standpoint because they save maintenance costs in the following ways:—

- 1—By permitting a demountable wheel, allowing inspection and wheel changes with minimum cost for labor and depreciation.
- 2—By having their wheel bearings enclosed in the main casing, protecting them from grit and thereby reducing the cost of bearing maintenance significantly.

9



# SHELDON

## Worm Gear Rear Axles

Reduce Upkeep Costs Materially Because They Facilitate Frequent Inspection and Overhauling

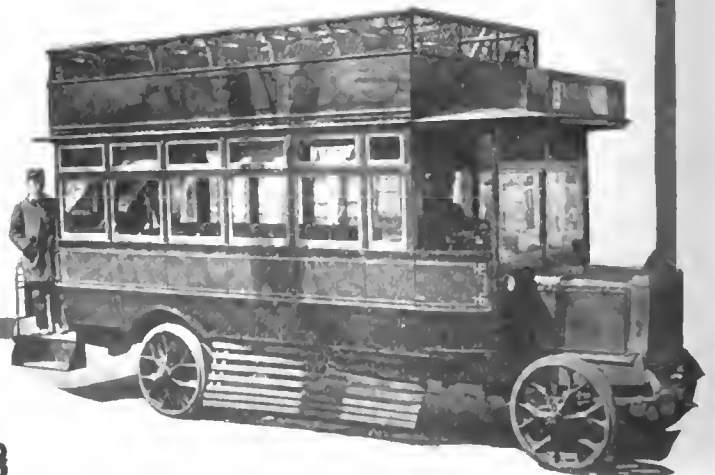
3—By the superior construction of Sheldon brakes, giving longer service with maximum efficiency and requiring a minimum of inspection, adjustment and repair.

4—By securing the silent operation that the public is coming to demand.

THE SIGNIFICANCE of this three-year test by the Fifth Avenue Coach Company is doubled by

the fact that very few firms in the United States are in a position to make so exhaustive a test. It brings out facts no manufacturer of trucks and heavy service vehicles can afford to neglect.

IF YOU ARE INTERESTED we can send you a reprint of a letter from the Fifth Avenue Coach Company giving their reasons for the adoption of Sheldon Axles in detail.



## Sheldon Axle & Spring Co.

Makers of Springs and Axles for Heavy Duty Service for over Fifty Years  
WILKES-BARRE, PENNA.



Please mention The Automobile when writing to Advertisers

# Whether it's a

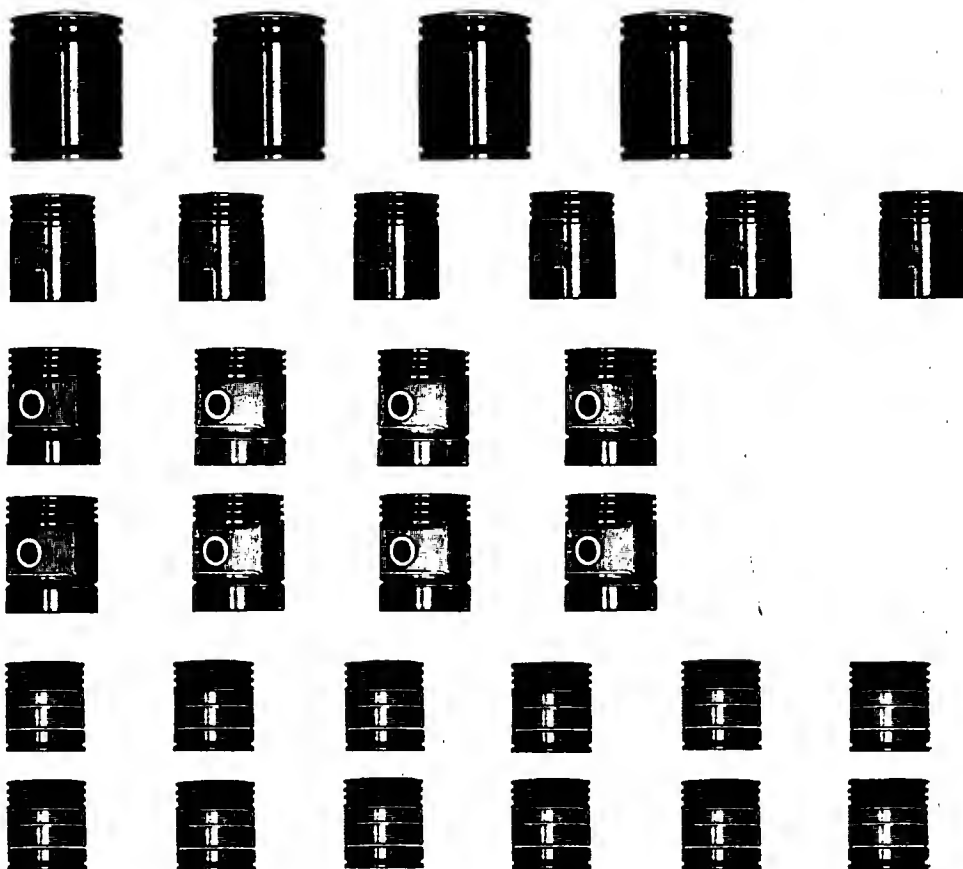
# Four

# Six

# Eight

# or

# Twelve



## -the Secret of Flexibility is *Inside* the Cylinders

How many cylinders? What about the bearings? The electrical system?

To these and a hundred other questions you've sought the answer before deciding on the car.

But have you concerned yourself with another question even more important—what's *inside* the cylinders?

What are the pistons made of? Are they of cast-iron—overweight, slow-gaited cast-iron, with its hammer and pound? Or are they made of that remarkable aluminum alloy LYNITE, strong as cast-iron yet weighing but one-third as much, making the pistons nimble and quick and soft of tread?

Until a few years ago practically all automobile engine pistons were cast-iron. Today cast-iron pistons are fast passing into memory.

The explanation is simple: From 40 to 50 times a second, depending on crankshaft speed,

the piston makes a round trip in its cylinder—100 starts, 100 stops almost in a clock-tick. At this high speed, any decrease in piston weight means increased flexibility and lessened vibration. And the greater the engine speed, the greater these advantages.

Thus you understand one of the big reasons why these leading manufacturers have adopted LYNITE Pistons as standard equipment and others are planning to do so on their 1918 cars.

- |                                 |                           |
|---------------------------------|---------------------------|
| The Biddle Motor Car Co.        | Monroe Motor Company      |
| Chalmers Motor Company          | Nordyke and Marmon Co.    |
| Chevrolet Motor Company         | Oakland Motor Company     |
| Cole Motor Car Company          | Olds Motor Works          |
| Jas. Cunningham, Son & Co.      | Packard Motor Car Co.     |
| Curtiss Aeroplane & Motor Corp. | Premier Motor Corporation |
| The Haynes Automobile Co.       | Scripps-Booth Corporation |
| McQuay-Norris Mfg. Co.          | Singer Motor Co., Inc.    |
| Mercer Automobile Co.           | The White Company         |
|                                 | Wisconsin Motor Mfg. Co.  |

Send for free booklet on Lynite Pistons.

The Aluminum Castings Company  
Cleveland, Ohio



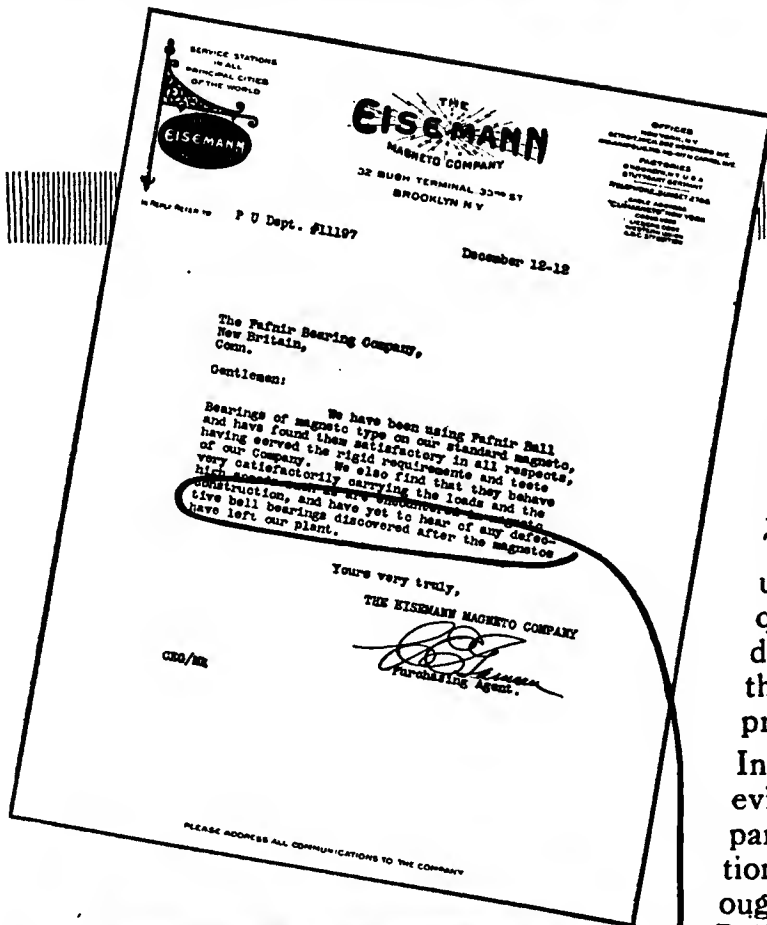
# LYNITE PISTONS

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# F A F N I R

QUALITY BALL SERVICE BEARINGS



The *Final* attainment of quality in any article requires that quality be the *supreme* consideration throughout its manufacture from *raw material* to *finished product*.

Theoretically, this procedure should insure uniform quality in every article produced. Practically, however, this is not true, for men are prone to err.

In order to counteract this evil, The Fafnir Bearing Company has developed an inspection system of the utmost thoroughness. Not only are Fafnir Ball Bearings subjected to a most rigid examination after each operation in the process of manufacture, but as a final precaution, each completed bearing is re-inspected in every detail.

Concerning the success of this fight for *uniform quality in every Fafnir Ball Bearing shipped*, the reproduced statement is significant



One of the inspection rooms

## The Fafnir Bearing Company

Conrad Patent Licensee

Detroit Office:  
752 David Whitney Bldg.

Main Office and Factory:  
New Britain, Conn.

Chicago Office:  
39 So. Clinton St.

Please mention The Automobile when writing to Advertisers



*The box that blocks  
Night Troubles!*

**H**ERE'S convenience and safety all in a box! For this handy little chest of Edison MAZDAS prepares for lamp burn-outs and renewals.

It's preparedness against the dangers of the unlit road, and the risk of a "lights out" fine.

You'll appreciate its help some time—maybe on a pitch dark night and a strange road—when a lamp burns out or breaks.

Then a chest of Edison MAZDAS will spare you delay and danger.

And safe! The lamps can't break, however badly bumped about. Each one is screwed

firmly into a socket, and protected by the stout walls of the chest.

\* \* \*

Whatever the year, make or model of your car, Edison MAZDA dealers have the right lamp for every socket on it. Have him load an Edison MAZDA Auto Lamp chest for you; then put it into your tool box and forget it—till the moment you need it.

EDISON LAMP WORKS of General Electric Co.  
Agencies Everywhere. HARRISON, N. J.

6998

*You carry an extra Tire, - Why not extra Lamps?*



# EDISON MAZDA

## Automobile Lamps



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## AUTOMOBILE EXPORT

One big outstanding fact is recognized by all—that South America needs our automobile products.

The way is open to establish ourselves permanently in this growing market.

Europe has long enjoyed a large percentage of this trade, but today conditions prevent her continuing in this field.

American manufacturers, of course, recognize this exceptional opportunity and are going after this business.

There can be no doubt that the American automobile, imported at first as a necessity to fill in a gap left through inability to obtain European cars, has now firmly established itself in this market. American manufacturers should maintain and control this market in the future.

The placing of worth-while agencies will be more difficult in the future than it is now. Most of the established houses which formerly imported from Europe which have not already established representation of American manufacturers are doing so now.

EL AUTOMÓVIL AMERICANO has been established by the CLASS JOURNAL COMPANY to furnish a direct means of communication between the American manufacturers in the automobile field and the automobile trade in South America and all the other Spanish speaking countries.

EL AUTOMÓVIL AMERICANO is the only trade paper devoted exclusively to automobile subjects going to these countries from the United States. It is printed in Spanish, published quarterly, and reaches every substantial dealer, jobber and garageman in South America, Central America, the West Indies and other Spanish countries.

The wide experience of the CLASS JOURNAL organization in the automobile field furnishes sufficient assurance that this magazine is editorially of a very high order. Judging from the enthusiastic response received from the first (January) issue, a great need has long existed for a magazine of this kind.

The April issue is now on the boats on its way to its readers.

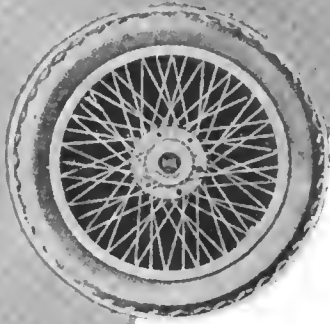
The next issue will be most important, as it will contain descriptions of the new models of cars and of the other latest products in the automobile line and will reach its readers just in time to enable them to place orders and obtain deliveries by the opening of the big selling season in November.

Advertising rates and sample copies will be gladly furnished upon request.

# El Automóvil Americano

231 West 39th Street, New York. N. Y.

# HOUK QUICK CHANGE WIRE WHEELS



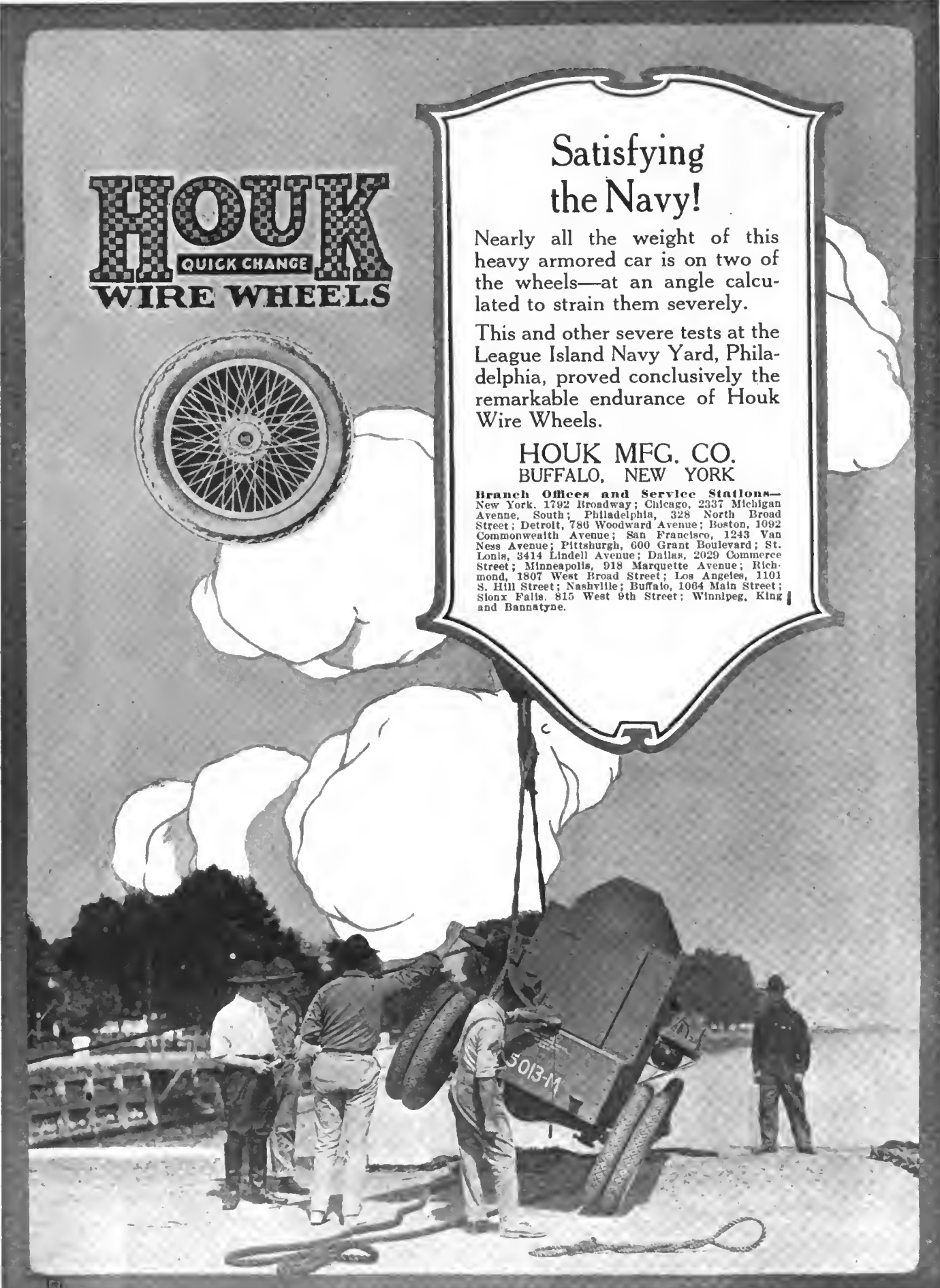
## Satisfying the Navy!

Nearly all the weight of this heavy armored car is on two of the wheels—at an angle calculated to strain them severely.

This and other severe tests at the League Island Navy Yard, Philadelphia, proved conclusively the remarkable endurance of Houk Wire Wheels.

**HOUK MFG. CO.**  
**BUFFALO, NEW YORK**

**Branch Offices and Service Stations—**  
New York, 1792 Broadway; Chicago, 2337 Michigan Avenue, South; Philadelphia, 328 North Broad Street; Detroit, 786 Woodward Avenue; Boston, 1092 Commonwealth Avenue; San Francisco, 1243 Van Ness Avenue; Pittsburgh, 600 Grant Boulevard; St. Louis, 3414 Lindell Avenue; Dallas, 2029 Commerce Street; Minneapolis, 918 Marquette Avenue; Richmond, 1807 West Broad Street; Los Angeles, 1101 S. Hill Street; Nashville; Buffalo, 1064 Main Street; Sioux Falls, 815 West 9th Street; Winnipeg, King and Bannatyne.



Please mention The Automobile when writing to Advertisers



Calibrating thermometer tubes for Boyce Moto-Meters.



Testing the range of thermometer tubes for Boyce Moto-Meters.



Blowing the bulb on the tube. The end of the tube is melted and the bulb welded to it.

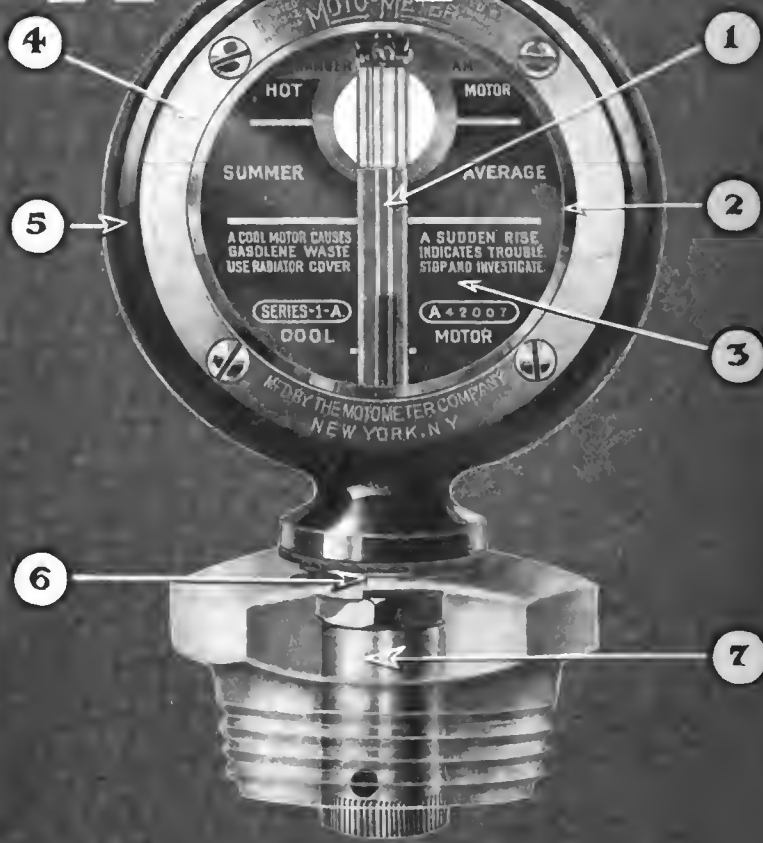


A corner of the enameling room.



Marking the tubes.

# BOYCE MOTO METER



## OUR NEW "STANDARD MODEL" HAS MANY IMPROVED FEATURES

- 1—Thermometer tube four times as large as all other types. This prevents breakage.
- 2—Heavy glass crystals which still further protects the instrument.
- 3—Black dial, white letters.
- 4—Copper rings nickel plated (rust proof).
- 5—Casing absolutely moisture proof; heavily black enamelled.
- 6—Leak proof washers.
- 7—Brass protecting stem.

An instrument of extreme accuracy for those who demand the best. Price, \$10.

THE MOTO-METER CO., Inc.  
15 Wilbur Avenue, Long Island City, N. Y.

# What is a Bound Brook Oil-less Bushing ?



Two halves of a single bushing, illustrating how inside is grooved and specially prepared graphite inlaid.

**BOUND BROOK** (*graphite and bronze*) Oil-less Bushings are constructed of high grade phosphor bronze, just like the other good bushings in your car.

But from this point on they are different.

On the bearing surface of a Bound Brook Bushing (the surface that comes into sliding contact with another surface) you will find a number of grooves or little trenches, packed solid by means of hydraulic pressure, with a special graphite lubricating compound.

Once the bushings are installed and in use the fine particles of graphite are distributed over the entire bearing surface of the bushing thus eliminating friction and greatly reducing WEAR. There is sufficient lubrication to last as long as the bushing itself.

You will find that the design of the graphite packed grooves varies

in different types of bushings. This is because each kind of bushing has grooves that are specifically designed to overcome certain forms of friction and wear.

Neither oil, nor water, nor climatic conditions, can ever dislodge the graphite from the bronze. Many car and truck manufacturers now use these bushings in the water pump where they run continuously in water and anti-freeze solutions without in any way affecting their inherent efficiency.

Bound Brook Oil-less Bushings might properly be termed "neglect proof" Bushings, for while oiling will add somewhat to their smoothness, fail-

ure to oil them does not affect their efficiency or service life.

Bound Brook Oil-less Bushings are used in the leading makes of cars and trucks in bearing places that are difficult or impossible to keep properly lubricated.

We have specialized in the production of Oil-less Bushings for more than a third of a century.

**BOUND BROOK OIL-LESS BEARING COMPANY**  
BOUND BROOK NEW JERSEY

*All Genuine Graphited Oil-less Bushings have always been made in Bound Brook, U. S. A.  
Also manufacturers of Nigrum Impregnated Wood Oil-less Bushings*

# BOUND BROOK OIL-LESS BUSHINGS

TRADE MARK REGISTERED UNITED STATES PATENT OFFICE

Please mention The Automobile when writing to Advertisers



A Ford Fan Belt that Sells  
at a Remarkably Low Price!

# Triple Stitch

Here's the kind of a Ford fan belt every dealer wants. Made of two plies of oak-tanned leather, stitched with three rows of waxed linen thread. Laps and plies thoroughly cemented together. Practically stretchless and very pliable. Can be sold at a surprisingly low price—that yields you a good profit. Write today for full details and name of jobber nearest you.

## Other Good Ford Parts

**FlatGrip FORD FAN BELTS:** Made of special fan belting leather. Will not crack across the face. Very pliable and practically stretchless. May be had either endless or detachable.

**Wetprufe FORD FAN BELTS:** Made of genuine belting leather. The best Ford Fan Belts we know how to build.

We are also ready to supply Wetprufe and FlatGrip Fan Belting in rolls to meet all requirements.

**CRANK HOLDERS:** Complete with leather strap and black japanned buckle. Made of heavy waterproof leather. Strap adjustable.

**STARTER BELTS:** Made of solid "V" belting, with or without lugs.

Brake Band Lining  
Clutch Lining  
Bonnet Lacing  
Radiator Hose  
Steering Knuckle Boots  
Top Straps

Rubber Bumpers  
Cylinder Head Gaskets  
Leather Washers  
Tire Straps  
Rebound Straps  
Etc., etc.

Write for full details, with name of nearest jobber. Use the coupon.

**Hide, Leather & Belting Co.** 227B S. Meridian St.,  
Indianapolis

*Tear out and Mail*

Hide, Leather & Belting Co., Indianapolis: Send full information as checked below, with name of nearest jobber. B

.....Triple Stitch Fan Belts .....Rubber Bumpers .....Brake Band Lining .....Bonnet Lacing  
.....FlatGrip Fan Belts .....Straps .....Clutch Lining .....Radiator Hose  
.....Crank Holders .....Starter Belts .....Cylinder Head Gaskets .....Steering Knuckle Boots

Sign name and address in margin below.

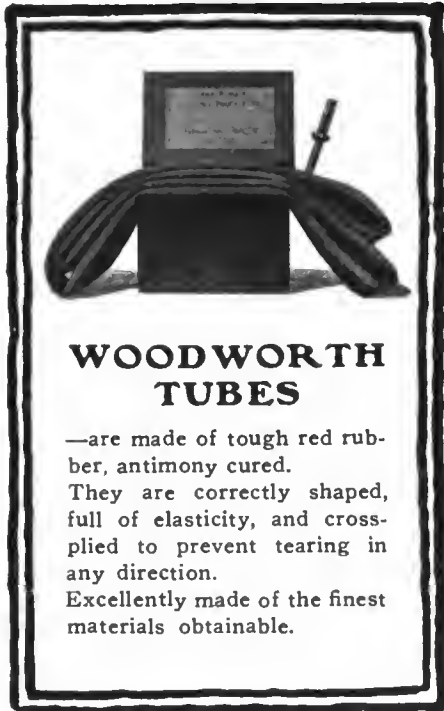
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# Every Consideration

of Pleasure, Safety and Economy

—demands that you buy a *real* tire, a Woodworth Tire, *in the first place.*

Why on Earth should a motorist buy a non-protected tire when he can get one guaranteed against trouble!



## WOODWORTH TUBES

—are made of tough red rubber, antimony cured. They are correctly shaped, full of elasticity, and cross-plied to prevent tearing in any direction. Excellently made of the finest materials obtainable.

# WOODWORTH TROUBLE PROOF TIRES

The Woodworth Tire is not a freak. It is not heavy, slow or stiff. It contains no metal. It is made precisely like the very best of other tires—of pure Para rubber and fine combed Sea Island cotton—

And then—after it is finished—a light, perfect-fitting strip of non-heating chrome

leather is snugly fastened on the underside—  
And it is guaranteed against puncture or blow out for 5,000 miles!



**WOODWORTH MANUFACTURING CORP.**  
Niagara Falls, New York

Canadian Factory: Niagara Falls, Ontario





# PRESSED STEEL PARTS

## What G.P.&F. Service Means In Times Like These

Many of the foremost manufacturers are using G. P. & F. Pressed Steel Parts. To them G. P. & F. Service is a tangible thing—a many-sided service that they have come to regard as unusually efficient—a service which in all its branches satisfies their most exacting requirements.

In furnishing pressed steel parts, we are prepared to handle orders of any quantity and make prompt deliveries. Our large modern plant covering 15 acres of floor space running year in, year out, at full capacity means lower production costs and money-saving prices. And our 36 years of "knowing how" means quality that conforms to the highest standards.

*Investigate G. P. & F. Service. Send samples or blue print for estimate.*

**GEUDER, PAESCHKE & FREY CO.**

1422-1700 St. Paul Ave., MILWAUKEE, WIS.



Please mention The Automobile when writing to Advertisers

# POVASCO

## RADIATOR FILLER CAPS



### An Immediate Success

**C**ONTRACTS for over 250,000 POVASCO Radiator Filler Caps followed the first announcement on this item of our line, made in February.

These orders, placed after engineers and purchasing agents compared ours with all others and then **SELECTED** POVASCO CAPS, prove that we have a proposition of considerable interest to manufacturers.

POVASCO Filler Caps are made of Bakelite with heavy brass inserts and are permanently durable, withstanding cold, heat, rain and sunshine without deterioration.



**POVASCO  
CONTROL BALLS**

POVASCO composition is now available for Control Handles, and presents an excellent opportunity for manufacturers who insist on quality and durability in every part of their equipment.

Furnished in 1 1/4 and 2 inch diameters, self-threaded, or with inserts as wanted.

Send us your blueprints and let us quote on your requirements.

At present made in 20 Types, covering about 100 models of cars, the line permits us to figure closely on any manufacturer's requirements, no matter how great.

Let us quote you for your whole production schedule. Our facilities insure prompt delivery at exactly the time you require the goods.

The manufacturer who uses POVASCO Radiator Filler Caps proves to the trade that only the best belongs on his car.

Send in Your Inquiry NOW.

**POUVAILSMITH  
CORPORATION**

Poughkeepsie, N. Y.

### Makes of Cars and Their Cap Numbers

Abbott-Detroit	8	Krit	6
Allen	2, 8	Locomobile	5
American Motors	12	Losler	10
Auburn	8	McFarlan	5
Barley	1	Madison	12
Bartholomew	8	Malcolm	6
Bell Motor	18	Martin Carriage	18
Bour-Davis	12	Maxwell	16
Buick	9	Mercer	18
Cadillac	4	Meteor	17
Carter Car	8	Michigan	8
Case	3	Mitchell	8
Chalmers (Model 17)	14	Moline	8
Chalmers 1912 or earlier	3	Moline Plow Tractor	1
Chalmers 1915-16-17	20	Moon	4, 6
Chandler	5	Oakland	5
Chevrolet Baby Grand	8, 12	Oakland, 1916	
Chevrolet Little Six	1	Little Six	1
Chevrolet Royal	8, 12	Oldsmobile	5
Chrysler	18, 16	Oldsmobile 1916	14
Cole	5	Palge 1914 or earlier	1
Crawford	3	Palge 1915	5
Cunningham	3	Palge 1915 and 1916	17
Dauch Tractor	1	Patterson	8
Denby	1	Pierce-Arrow	8, 5
Detroitler	17	Pilot	6
Diamond T Truck	8	Reo	19
Dodge	2	Republc Truck	8
Dort	8	Rock Hill Motor Buggy	12
Empire	1	Ross Eight (All Models)	17
Fisher-Magic	3	Saxon	8
Ford	11	Scripps	1
Gilde	7	Service Truck	8
Grant	8	Shaw Taxicab	8
Haynes	8	Speedwell	8
Henderson	5	Standnrd Truck	8
Herreshoff	6	States Motor	13
Hudson 6-40	4, 6	Stearns-Knight 4 cylinder	5
Hupp 1915 nnd after	7	Stearns-Knight 8 cylinder	8
Imperial	3	Stevens-Dnyea	5
Indiana Truck	8	Studebaker	2
Interstate	8	Stuts	3
Jackson	8, 8	Sun	12
Jeffrey 4 cylinder	17	Velle 1916	8
Jeffrey Truck	17	Velle 1914 nnd	8
Jeffrey 1916 and 1917	15	1915	2
Kentucky Wagon	13	Westcott	3
King	1, 12	White	3
Kissel Kar	5	Winton	8

The Peerless Dealer's Big Advantage

# Two Power Ranges

*Maximize Enjoyment  
Yet Minimize Expense*



THE PEERLESS Eighty Horsepower Eight is a car of "dual personality."

It has two separate and distinct power ranges—each highly desirable for its particular purpose.

You have tremendous power and abundant speed when and where you want it, without excessive cost in operating the superpowerful car in ordinary driving.

These great advantages have never before been offered in combination. They have been available only in two cars of entirely different and opposite types.

*The  
"Loafing"  
Range*

In ordinary driving you get the velvet smoothness, the keen flexibility and the graceful, effortless performance you would naturally expect from a Peerless.

This is the "loafing range" for every day requirements and the motor is operating on half rations—consuming so little fuel as to put many lesser powered cars to shame—most sixes, even many fours.

But open the throttle a little wider to release the double poppets.

Now you have a brute of a car of utterly changed character.

With the "sporting range" in action she has the superpower and thundering speed to cope with any emergency, to contend with any of the other master cars of the day.

*The  
"Sporting"  
Range*

A ride at the wheel of a Peerless Eight will show you a wider range of performance than you have ever before found in any one car. It gives the Peerless dealer a big advantage. The car demonstrates wonderfully—convincingly.

The Peerless Motor Car Co., Cleveland, O.

# Peerless Eight



*Peerless*  
All that the name implies

Touring . . . . .	\$2090
Roadster . . . . .	\$2090
Sporting Roadster . . . . .	\$2250
Coupe . . . . .	\$2750
Sedan . . . . .	\$2890
Limousine . . . . .	\$3590

Prices f. o. b. Cleveland  
Subject to change without notice

Please mention The Automobile when writing to Advertisers

# How can I simplify my Worm Drive?

This Bulletin contains a complete answer to the question above



*No separate thrust bearing is needed when Gurney Radio-Thrust Bearings are used*

## GURNEY BALL BEARING COMPANY

Conrad Patent Licensee

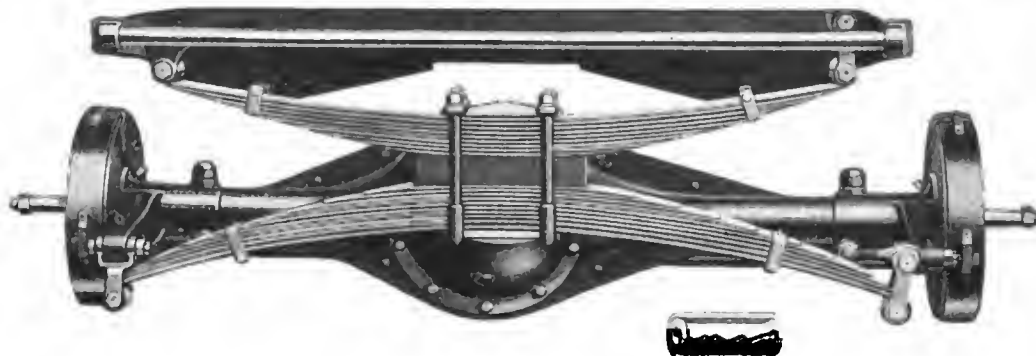
Chicago, Ill.

Jamestown, N. Y.

New York City

153

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Rear Spring Suspension Showing Cross Compound Cantilever Construction and Never-Oil Bushing Used in the Spring Shackles

## Scientific Spring Suspension Gives **THE MONROE** Its Superior Riding Qualities

Few cars, regardless of price, weight or wheelbase, offer the riding comfort and ease of control of the Monroe.

On country roads, even at speeds as high as 40 and 50 miles an hour, the Monroe hugs the roads. So smoothly does it ride, one is unconscious of the speed.

This remarkable roadability is due to the scientific spring suspension and proper distribution of weight in the Monroe.

The cross compound cantilever spring construction reduces weight, smooths out the heavy jolts and jars of country road driving, and does away with side-sway.

All of which means extreme riding ease and comfort. And a saving of tires and engine wear that tells its own story in upkeep economy.

### 40% More Efficient

Compared with the best four-cylinder engine of equal size and piston displacement on the market today, the Monroe offers you an increase of over 40 per cent in power output per cubic inch of piston displacement and an increase of

over 25 per cent total horsepower available.

We have added no cylinders. Nor have we increased their size. We have simply turned waste power into reserve power.

A fully counterbalanced crankshaft, a perfect system of lubrication eliminating vibration and friction, and a highly improved method of carburetion make possible this matchless performance.

### You Be the Judge

We know these are strong claims. We know that they mean unquestioned supremacy for the Monroe among cars anywhere near its price.

But we don't ask you to take our word for it. Prove it to yourself. Ride in it. Drive it. See it climb the steepest hills without effort. Throttle it down to 3 miles an hour on high. Watch it accelerate from 5 to 50 miles an hour so quickly and smoothly that you will hardly realize the change in speed.

One ride will convince you that the Monroe stands supreme in its class. And why?

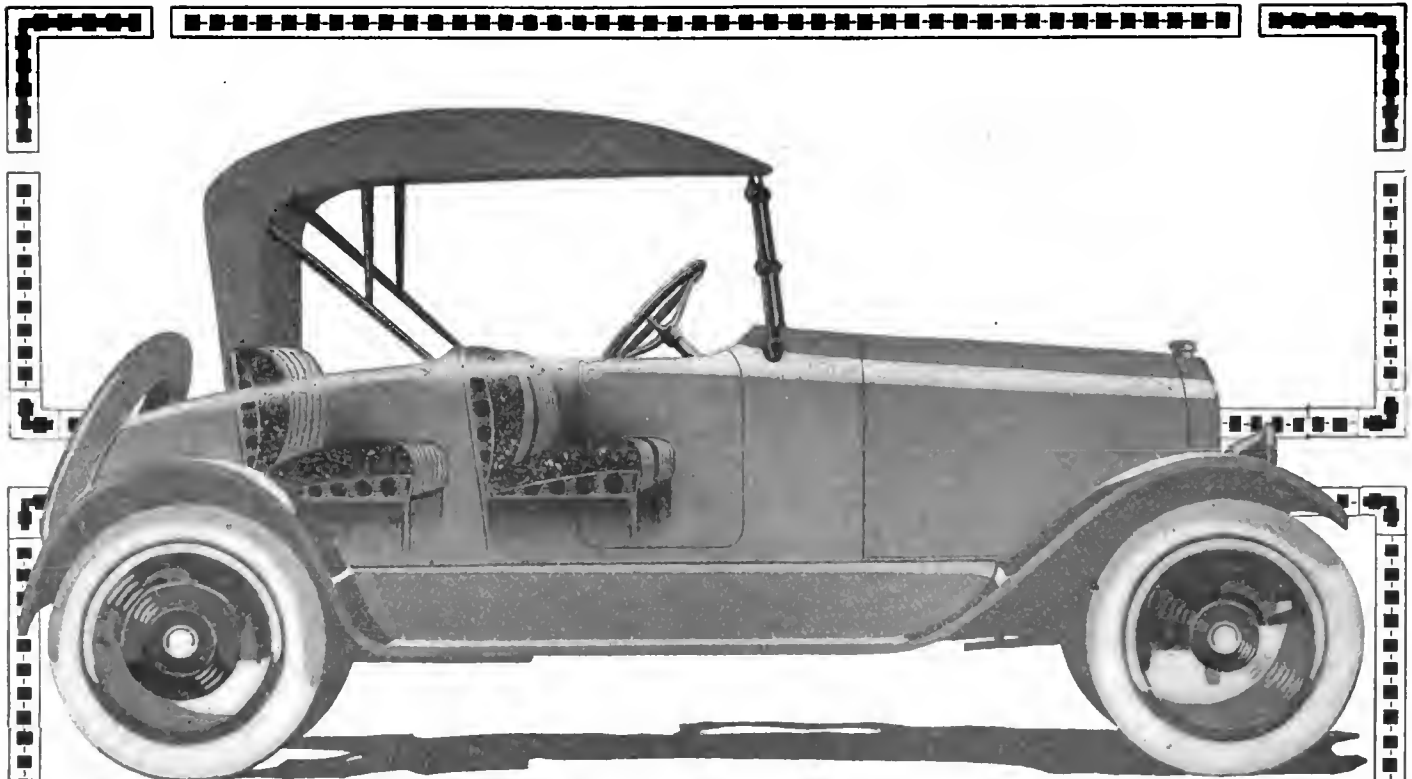
Price \$1095. f. o. b. Pontiac, Mich.

**MONROE MOTOR COMPANY, PONTIAC, MICH.**

*Makers Also of a Small "Four" in Sedan, Roadster and Club Models*



Please mention The Automobile when writing to Advertisers



## You Actually Ride on the Cushions of Your Car

COMFORT is the first thing for you to think of when you buy your new car. You cannot have comfort in your new car unless the cushions are filled with

### Wilson's Sterilized Curled Hair

Wilson's Curled Hair is universally conceded to be the best filler for upholstery purposes. Its merit is so generally recognized that over half of motordom rides on upholstery accomplished with it.

Curled Hair does not break down or lose its comfort-giving qualities. It provides permanent, easy riding.

Upholstery that becomes hard, flat or lumpy destroys comfort, regardless of the use of shock-absorbers. The upholstery is the point of contact between the passenger and the car.

Do not be misled by recommendations of special spring construction designed to eliminate the use of Curled Hair. New and untried contraptions make their appearance periodically, but Curled Hair "goes on forever."

### Springs Respond to Shocks—Wilson's Curled Hair Absorbs Them

Be sure that Wilson's Curled Hair is used in the upholstery of your new car.

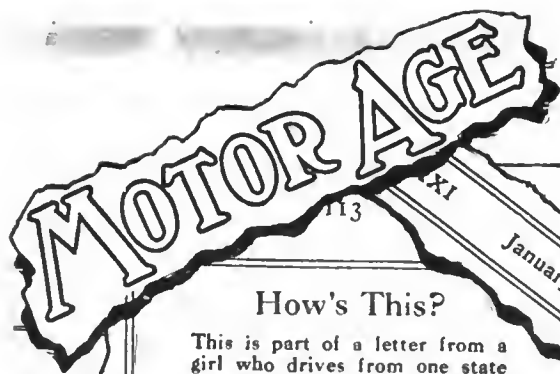
Manufacturers and Upholsterers—Send for samples of Wilson's Curled Hair with prices and full particulars.

This mark



41st Street and Ashland Avenue  
CHICAGO

Please mention The Automobile when writing to Advertisers



How's This?

This is part of a letter from a girl who drives from one state to another as a matter of course, and she has had a good deal of experience in driving. Perhaps what she has to say will help you.

"I always equip one of the side pockets with a sort of 'Safety-First' outfit, consisting of small bottles of turpentine, peroxide, iodine, bandages, scissors and anything else that might be needed in case of accident.

"Probably the thing that makes driving easy with me is that I have a way of shifting the gear with my foot. Any car that has the 'H' shift can be managed in this way. It enables one to always keep the eye on the road and does away with the possible missing of the lever and the strained position one sometimes

*A Sensible thing to do!*

**But the Easiest Way to do it is to Get a Martinkit**  
*And Motorists Are Finding This Out Mightily Fast*

Dealers are selling these outfits without effort. A display on the counter sells to nearly every motorist who sees it.

It moves fast, takes up very little room and requires but a small outlay of money.

Write for exceedingly profitable terms.

Garagemen can interest every motorist coming into their garages by having the Martinkit on display. Every motorist needs one—and they are buying them fast.

The kit contains everything necessary for treatment of scratches, burns, cuts and even severe wounds neatly packed in a box that fits into door pocket of car.

Write for discounts.

Price \$2.00.

**MARTINKIT**  
 FIRST AID  
 TRADE MARK

**The Martin Auto Accessories Corporation**  
 Rochester, New York

- Distributors**  
 Hughson & Merton, Inc.,  
 530 Golden Gate Ave., San Francisco, Cal.  
 Distributors for the Pacific Coast.
- Bacrog Accessories Co.,  
 Richmond, Va.  
 Distributors for Virginia, North Carolina and District of Columbia.
- The Martin Auto Accessories Corp., O. L. Butler, Mgr.  
 Baltimore, Md.  
 Distributors for Maryland
- The Banner Tire & Supply Co.  
 Euclid and East 19th Sts., Cleveland, Ohio.
- Distributors for Cleveland.  
 Stokes Auto Accessories Corp.,  
 2260 North Bancroft St., Phila., Pa.



Please mention The Automobile when writing to Advertisers

## Automobile and Axle Builders—

Send for the Bailey Non-Skid, Non-Stall Differential and put it into your testing car—it requires no change of housing or bearing layout. Try it out through mud, sand, slush, snow and over wet asphalt and you will find a steady, straightforward pull that keeps the car moving ahead with all wheels in line.

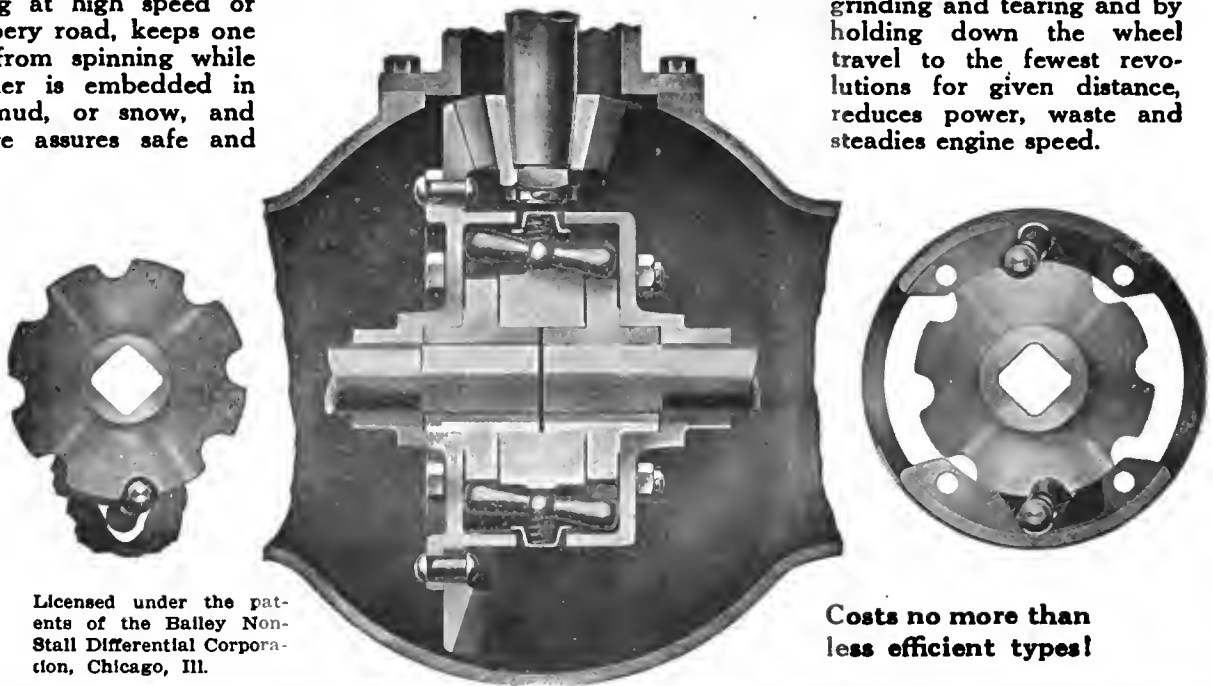
Notice the perfect compensation in turning corners, and the absence of wheel spinning, side-sway, and skidding on the straightaway that always accompany an ordinary gear differential. These features are strong selling arguments that the motoring public are quick to grasp—start your investigation soon.

# BAILEY NON-SKID NON-STALL DIFFERENTIAL

Not only compensates perfectly in turning but on straightaway locks to drive both rear wheels, **positively and equally** on a practically undivided axle. This equalized driving power, impossible with an ordinary differential, keeps the car from swerving at high speed or on slippery road, keeps one wheel from spinning while the other is embedded in sand, mud, or snow, and therefore assures safe and

sure passage on roads where a gear-differential-equipped car would skid or stall.

Obviously, then, the equalizing power distribution also makes steering easier, makes the car hold to the road better, protects tires from disastrous grinding and tearing and by holding down the wheel travel to the fewest revolutions for given distance, reduces power, waste and steadies engine speed.



Licensed under the patents of the Bailey Non-Stall Differential Corporation, Chicago, Ill.

Costs no more than less efficient types!



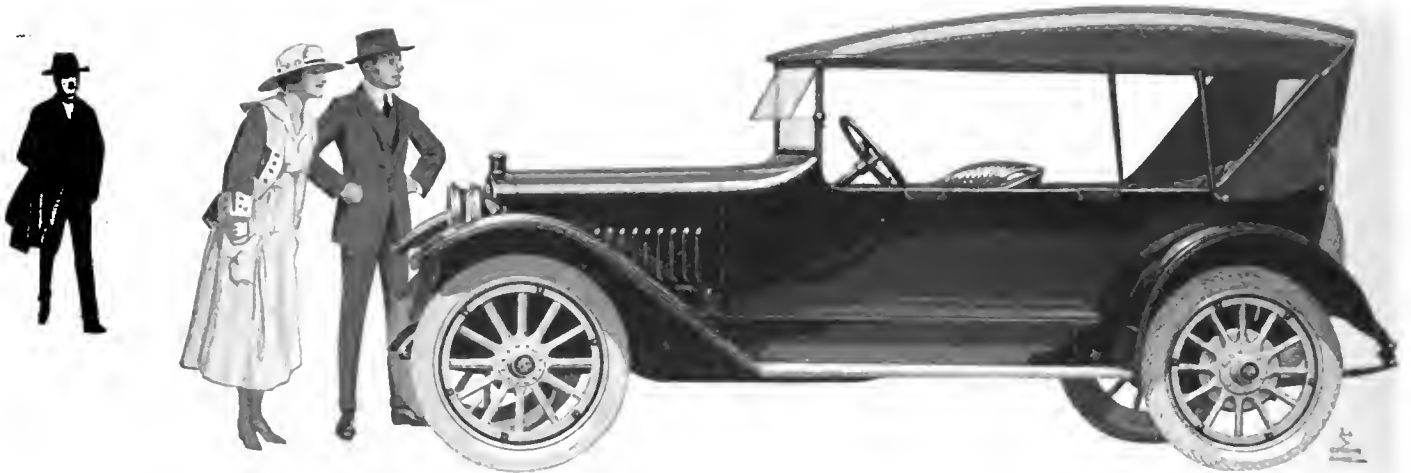
# NEW PROCESS GEAR CORPORATION

SYRACUSE, N. Y.





# The New Hupmobile



## Rare-Beauty, High-Duty

Already supreme in performance, the new Hupmobile claims supremacy in beauty. The high-duty car is now the rare-beauty car as well.

From the battle of cylinders, the Hupmobile has emerged the champion four. It has won not only over other fours. Its phenomenal pulling power has out-classed sixes, eights, even twelves.

### Preferred for Performance

For two years proof has been plentiful. It is daily given anew. By dealers in demonstration. By owners in everyday use. By records like those made in the 20,000-mile Capital-to-Capital Tour.

Many times performance has brought the Hupmobile preference over cars that cost more, or have more cylinders.

The new Hupmobile is the same splendid performer. In sand, in mud, on the hills, it will add new chapters to Hupmobile history. Over and over again it will demonstrate the value of Hupmobile quality.

### Quality Higher Than Need Be

For quality is still first with us. That quality which begets long life and superior performance.

We know our motor is better than need be. So much better, indeed, that other manufacturers call it fit for a \$3,000 car. We could use a less costly

clutch. The same with the transmission, the rear axle.

### Beauty Crowns Other Virtues

But even if we would, we could not give our buyers less. And we do not choose to give them less. From the first, people have bought the Hupmobile for its

goodness. We want them always to buy it for that. Now we crown performance and quality with year-ahead beauty. The new Hupmobile bears the style distinction its inner virtues deserve. We do not look for its equal in beauty this year.

It is, in fact, the most beautiful Hupmobile we have ever built. It carries a finer finish. It is more luxurious. It is still more complete.

We could have paid for this extra value by saving on inner quality. Instead, we increased our production. We invested heavily in additional buildings and machinery. We reduced costs by increasing production.

### Judge by What It Is and Does

That is why you now get rare-beauty—year-ahead beauty—in this high-duty car. Thus we make good its claim to new supremacy.

Never before has a car of Hupmobile type shown such refinement of detail. Never before has a four-cylinder car had such a wondrous performance-record.

We expect you to judge the new Hupmobile solely on its merits. If you will do that—if you will check its beauty, its quality, its performance against the same features of other cars—we know what your decision will be.

### 25 Style Features Such As These

Bright finish, long grain, French seam upholstery  
Improved cushions and lace type back springs in seats  
Leather-covered molding finish along edge of upholstery  
Neverleak top, black outside, tan inside—waterproof  
Tonneau gipey quarter curtains, integral with top  
Front and rear edges of top finished with leather-covered molding with aluminum ferrule tips  
Bow spreaders to carry top when folded  
Hupmobile-Bishop door-curtain carriers, folding with curtains—exclusive feature  
Bright leather hand grip-pads on doors

Large door pockets with special weighted flaps  
Body a new color—Hupmobile blue  
New variable dimming device gradates brilliance of head lights  
Tail lamp operates independently of other lamps  
New soft operating clutch

#### Six Models

Five-Passenger Touring Car	\$1285
Roadster	1285
Seven-Passenger Touring Car	1440
Year Around Touring Car	1485
Year Around Coupe	1470
Five-Passenger Sedan	1735



The Mark of Superior

Motor Car Service

Ask us to send you the report of the United America Tour—an engrossing story of how the Hupmobile, in visiting every state in the Union, crowded four years of travel into four short months, and mapped a new route from Washington to every state capital and back to Washington. Get the pictures of every capitol building in the country.

Hupp Motor Car Corporation  
Detroit, Mich.

Please mention The Automobile when writing to Advertisers

# Departments of Your Plant

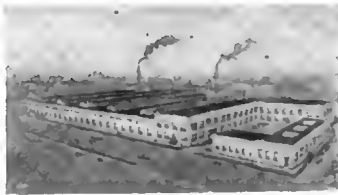
**1**



Valves  
Spring Bolts  
King Bolts  
Push Rods

**The Steel Products Co.**  
(Main Plant)  
Clarkwood Rd., Cleveland, O.

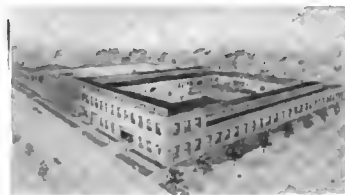
**2**



Drag Links  
Brake Rods  
Lamp Brackets  
Starting Cranks

**Michigan Plant**  
Hart Ave., Detroit, Mich.

**3**



Chassis Bolts.  
Any bolt 2 1-2  
inches or long-  
er not hard-  
ened or ground.

**Metals Welding Plant**  
Perkins Ave., Cleveland, O.

**T**HESE THREE UNITS are like departments under your own factory roof.

Each is equipped and organized for the rapid production of a certain, few automobile parts.

All are working with the one idea of giving you the same results and service that you get from a manufacturing division in your own organization.

*Please address inquiries to individual plants as above.*



# The Steel Products Co.

Please mention The Automobile when writing to Advertisers

# Presto Specialties

## Touring Necessities Wherever You Go



No. 252—Combination Cigar Lighter, Holder and Cord Winder, \$5.00. (Four other styles.)



No. 291—Combination Searchlight, Trouble Lamp.



No. 286—Inspection Trouble Lamp. (Three other styles.)

PRESTO Cigar, Pipe and Cigarette Lighters, Inspection, Trouble and Hand Lamps, Cowl, Dash and Step Lights are found on best equipped cars the world over.

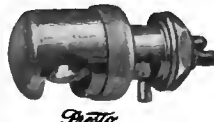
Indispensable for convenience and safety on any long tour or short drive.

PRESTO Accessories are obtainable at most good dealers.

Jobbers: Send for electros of new PRESTO Specialties for your Spring catalog.

**METAL SPECIALTIES MFG. CO., Inc.**

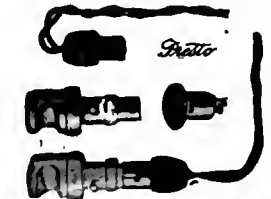
730-738 W. Monroe St., Chicago  
 Eastern Branch: 16-21 West 61st St., New York City  
 Western Branch: 149 New Montgomery St., San Francisco



No. 655-S—Lamp for Metal Dash. (12 other styles.)



No. 190—Pipe and Cigar Lighter. \$1.50



No. 230-S—Combination Dash and Trouble Lamp with Lever Switch. (Made in four styles.)

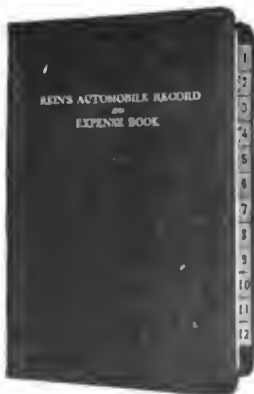


No. 637-S—Dash Lamp for Ford and all other cars with switch (15 styles.)

**MOTORISTS!**

**BUSINESS HOUSES!**

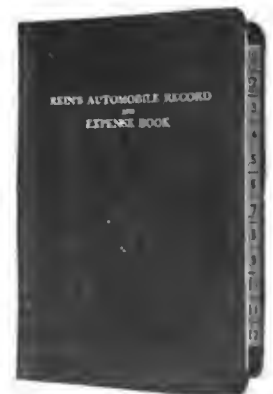
## Something New in an Automobile Expense and Record Book



This book provides a complete record of operating cost under appropriate headings, which are easily and quickly compared. This record is simple, accurate and adapted to all circumstances and conditions under which the automobile is used.

Consisting of Twelve Thumb Indexed Sections Provides Services in Either or All of These

- Ways:**
- As a record of trips, addresses, miles, runs, etc.
  - As an identification, insurance and car outfit record.
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  - As a tire and inner tube record which eliminates any possibility of disputes in rebating.
  - As a complete record to reduce operation of car to basis of economy.
  - As a record of repairs, sundries, Garage expense, etc.



Sufficient Space Under Each Indexed Section For An Entire Year's Record

**PRICES:** Cloth Binding, \$1.00; Flexible Leather, \$1.50

ASK FOR REIN'S AUTOMOBILE RECORD AND EXPENSE BOOK, AND ORDER FROM

**Book Department, Class Journal Company, 239 West 39th Street, NEW YORK MALLER BLDG., CHICAGO, ILLINOIS**



# LISTEN—

## Motor Manufacturers!



By every test you will find the "FULFLO" Water Circulating Pump to be the most efficient for cooling your motor—automobile, aeroplane or marine. It is a small, compact, light but very powerful centrifugal pump. *Write for particulars.*

**The Fulflo Pump Co.**  
128 Opera Place, Cincinnati, Ohio

# HALLADAY BUMPERS



**FRONT AND REAR  
FOR ALL CARS**

The Halladay Line is Complete in Style, Price and Design, including several models of front and rear Bumpers for cars of standardized design, and special models for front and rear of Briscoe, Buick, Cadillac, Chevrolet, Dodge, Ford, Franklin, Mitchell, Overland, Packard, Pathfinder, Saxon and others, the construction of which precludes the use of standard bumpers.

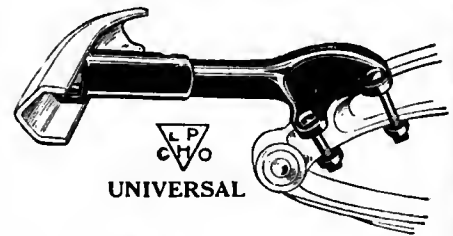
Our quality and prices are right and dealers' terms are satisfactory.

Write us or our jobbers for catalog and full details.

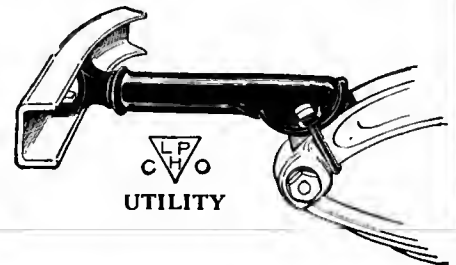
**L. P. HALLADAY & COMPANY, Streator, Illinois**

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**UNIVERSAL**



**UTILITY**



## DRIDEK

### A Remarkable Covering for Automobile Tops

IN MAKING DRIDEK, WE HAD FOUR OBJECTS IN VIEW:

That it must be absolutely waterproof.

That it must stand up under the hardest kind of wear.

That it must be pleasing and handsome in appearance.

That it must sell at a price that manufacturers and consumers can afford to pay.

DRIDEK EASILY MEETS ALL THESE CONDITIONS, and it is up to you to investigate DrideK and realize its remarkable qualities.

DrideK is a timely addition to our big line of BULL DOG QUALITY Rubber Cloths and Rubberized Fabrics.

Send for samples and price list.

**L. J. Mutt Company**  
Boston, Mass.



## Stop at the Woodstock

FORTY - THIRD ST., NEAR BROADWAY



Located just off Times Square

## The Hotel Woodstock

is within a handy walk of everything—terminals—subways—elevateds—surface lines—theatres and the automobile district, yet you can have quiet, refinement and service withal.

Single Room, with Bath . . \$2.00 and \$3.00 for one  
Single Room, with Bath and Two Beds, \$4.00  
and \$5.00 for two

European plan restaurant  
unexcelled for its cuisine

Service and accommodations unsurpassed for completeness and efficiency

Write for our Map of New York

W. H. VALIQUETTE,  
Managing Director

A. E. SINGLETON  
Asst. Manager

A large circular logo at the top of the advertisement. The outer ring contains the text "THE MARK OF A BETTER RADIATOR". Inside the ring is a stylized "G & O" monogram.

QUALITY  
**RADIATORS**

FOR  
PLEASURE CAR  
AND  
HEAVY DUTY SERVICE

**G & O MFG. CO.**  
NEW HAVEN CONN.

# PARK INTEGRALLY COUNTER BALANCED

Patent Applied for



Quick Get-a-way  
Higher R.P.M.  
Reduced vibration  
Smoother running motor  
Eliminated bearing troubles

We have shipped 42,171 Counterbalanced Crankshafts to April 27, 1917

## The Park Drop Forge Co.

Cleveland

**Dealers** Can you think of another motor part used by as many high class manufacturers as AC plugs?

# AC Spark Plugs



"Made in Flint"

*The Standard Spark Plug of America*

## This Is the Plug

and these are manufacturers of high class motor cars and trucks who have made AC spark plugs standard equipment.

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|-----------|------------|-------------|------------|-------------|--------------------|--------------------|
| Cadillac  | Buick      | Reo         | National   | Davis       | American-La France | Gramm-Bern-        |
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| Arrow     | Oldsmobile | Pierless    | Jackson    | Murray      | Dishrow            | Wilcox Truck       |
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| Chandler  | Liberty    | Stutz       | Paterson   | Stephens    | Signal Truck       | Samson Tractor     |
| Haynes    | Crane-     | Pathfinder  | Detroit    | Dodge Bros. | Brockway Truck     | Acme Truck         |
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No Greater Recommendation Can Be Given a Spark Plug

Champion Ignition Co., Sole Manufacturers, Flint, Mich., U. S. A.

## Is Your Car AC Equipped ?

Please mention The Automobile when writing to Advertisers

## Why Tie Progress to Precedent?

**Y**OU know that real grain leather is scarce and costly. The price of shoes alone proves this fact. You know that so-called "genuine leather" (or leather splits) is only a substitute for real grain leather. Knowing these facts, then, and realizing that you must knowingly accept a substitute, why not get the best substitute for grain leather that the market affords?

If you can't get real grain leather upholstery on your new car, don't take split leather sold as "genuine leather." Get



## Motor Quality

Get it for your own protection. Get it because it is twice as strong as coated splits. Get it because it is water, dust and grease-proof. Get it because it will give you service equaled only by real grain leather. And, last but not least—get it because its quality, texture and color are always uniform—more uniform than any leather split can ever be.

Write for samples and booklet today.

**Du Pont Fabrikoid Company**

WILMINGTON, DEL.

Toronto, Ont.

World's Largest Makers of Leather Substitutes



### LE ROI MOTOR

3 1/8 x 4 1/2 MODEL C  
FOR THE LIGHT ROADSTER  
TOURING CAR  
OR  
TRUCK

Used by leading manufacturers of best-known American-made light trucks.  
The business of manufacturing Le Roi Engines, formerly conducted by Milwaukee Machine Tool Co., is now carried on by

**Mitchell St. and 60th Ave.**  
**MILWAUKEE, WIS.**

Write for Complete Information

## KIMBALL CORD TYPE TIRES

**GUARANTEED 5,000 MILES**

Kimball Tires cost our distributors less than second tires

30x3	.....\$ 7.00	30x3 1/2	.....\$ 8.95
32x3 1/2	..... 10.30	34x4	..... 15.05

Other sizes just as low

Thousands of dealers have taken advantage of this opportunity to double their profits and business.

**Kimball Tire & Rubber Co.**  
1471 MICHIGAN AVE., CHICAGO

Write immediately for territory!

"Straight-Side" Type, as pictured  
Made also in Clincher Type

**HERE'S THE BOOK YOU NEED**

REPAIRING, DIAGNOSING TROUBLE, ALL ELECTRIC SYSTEMS SIMPLIFIED, CARBURETION, IGNITION, ETC.

### DYKE'S Automobile and Gasoline Engine Encyclopedia

—tells you how to diagnose and remedy any trouble.  
—teaches you the principle of all engines, valves, carbureters, ignition, self-starters—in fact, everything you want to know.  
—teaches you to overhaul a car from the ground up; how to make all repairs, etc.

**NOTE**—The revised Book is now ready with many new subjects added. The electric section of the book is up to date and thoroughly treats on the principle, construction, operation and care of leading Electric Starting, Generating, Ignition and Lighting Systems, Delco, Atwater-Kent, Bosch "two point" and other systems are simplified.

**FORD INSTRUCTION**—complete—now added.  
**Six, Eight & Twin Six engines simplified.**  
Price, \$3.00

**FREE** supplement with Encyclopedia treating on construction and adjustments of the Packard Twin Six, King Eight and Ford.  
If not satisfactory, return

**Book Dept., THE CLASS JOURNAL CO.**  
239 W. 39th St., New York      Mollers Bldg., Chicago, Ill.



Use the facilities of this perfectly equipped plant for the production of small sheet metal stampings of any design, also

**BRASS CASTINGS**

*In the Rough, Polished or Nickel Plate*

including Hub Caps, Radiator Filler Necks with Caps, Gasoline Tank Flanges with Caps, Gasoline Tank Flanges for Outlets, Hood Yokes, Ford Special Hub Caps and other parts made of Cast Brass.

**Our Well-Equipped Wood-Working Department**

is prepared for the prompt production of quantity orders of rough or highly finished wood-work assemblies of medium size for motor car construction, such parts as rest blocks for shipping, flooring boards, back spring boards, running boards, etc. We work from Blue Prints and Specifications, but prefer, when possible, to also have samples for the purpose of securing positive accuracy in weight, measurements and design. Write us at once for further information regarding the production of your requirements.

**The Pfau  
Mfg. Co**



**Cincinnati  
Ohio**

230 Mentor St.



Tool Crib  
Dodge Bros.



**Discrimination  
in Selection**

Manufacturers who recognize the value of accurate work throughout the production and repair of automobiles and their accessories should use careful discrimination in selecting large measuring tools for their shop tool-rooms. Most manufacturers, tool-makers and machinists find that the use of

**Starrett**  
TRADE MARK  
REG. U.S. PAT. OFF.  
**Tools**

assures them of the highest practical degree of accuracy. By equipping your toolroom with Starrett Tools of large capacity, such as calipers, dividers, micrometers, vernier calipers, height and depth gages, dial test indicators, etc., your workmen cannot blame the measuring instruments for inaccurate work.

A postal request will bring our free catalog No. 21FH to you. It describes 2100 styles and sizes of fine tools.

**The L. S. Starrett Co.**

*The World's Greatest  
Tool Makers*

**Athol, Mass.**

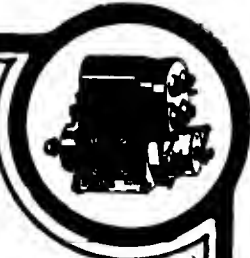


42-646



**The Best Spark**

in the retard at low speeds and in the advance at high speeds



HIGH TENSION  
**SIMMS**  
MAGNETOS

with their patented pole shoes give the same hot spark when the engine is barely turning or when it is racing. This means easy starting, rapid acceleration, added flexibility and horsepower.

*Write for literature*

**THE SIMMS MAGNETO CO.**

273 No. Arlington Ave.  
East Orange, N. J.





# FELT—

**WASHERS  
GASKETS  
WICKS  
STRIPS, ETC.**

¶ A factory, equipped to best supply the special needs of the **AUTOMOBILE TRADE.**

¶ Put the burden of Proof upon us—write today. There's conviction waiting for you.

## **ADVANCE FELT SPECIALTY & CUTTING CO.**

324 South Jefferson Street, Chicago

Sales Offices

Kresge Bldg.,  
Detroit.

Fifth Ave. Bldg.,  
New York City.

# Truck Manufacturers

have proved  
that it pays to equip with



Many of the largest and most important makers of motor cars for commercial purposes have installed "Jasco" tanks as part of their regular equipment. They have done this because facts have shown them that the absolutely non-leakable, long-wearing, fire-preventing features of these tanks are highly appreciated by customers.

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*("Jasco" Tanks are equally as popular for pleasure cars)*

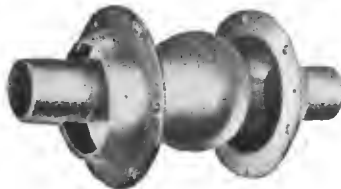
## **JANNEY, STEINMETZ & COMPANY**

Main Office, Philadelphia

New York Office, Hudson Terminal Building

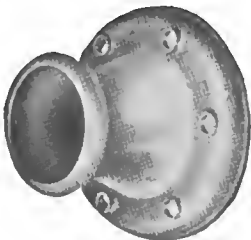


In the most perfect plant that brains, money and experience could devise, we have the men and equipment to produce pressed steel parts in any quantity on comparatively short notice. We make more than 200 pressed steel parts and you can make your vehicles lighter and at lower cost, without sacrificing strength if you use *pressed steel* spring hangers, running boards, brake drums, etc., instead of malleable iron, steel castings and drop forgings.

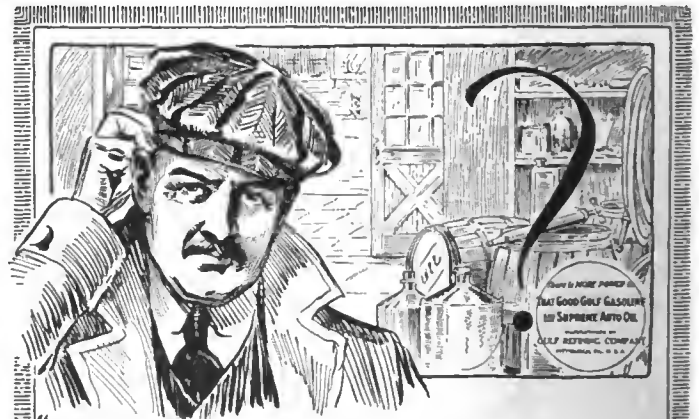


## **"THE BOSSERT WAY"**

stands for the prompt delivery of your order filled in accordance with every item of the specifications.



**The Bossert Corp.**  
**UTICA**  
**N. Y.**



## **"What am I Feeding my Engine?"**

Carbon, the greatest detriment to engine efficiency, may be minimized by the proper choice of lubricants. For instance—

## **SUPREME AUTO OIL**

being manufactured from Asphalt Base Crude, *leaves less carbon*, as it contains no paraffine to gum and stick. At the same time it affords perfect lubrication.

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*The Largest Independent Refining Company in the World*

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**Mr. Car Owner:**

Keep your car looking new, by using

**Be-Be-Co Shine Up Specialties**



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|---------------------------|----------------|
| Mohair Top Dressing       | Brass Polish   |
| Leather Top Dressing      | Nickel Polish  |
| Top Lining Dye            | Body Polish    |
| Seat & Slip Cover Cleaner | Motor Car Soap |
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**BOSTON BLACKING COMPANY**  
 Est. 1890 (Specialty Dept.) Inc. 1900  
 East Cambridge, Mass. (Home Office and Factory)

Branch Factories:  
 Chelsea, Mass.; Montreal, Canada; England, Germany, France,  
 Austria, Sweden, Italy, Australia.  
 Branch offices and warerooms in all large cities.



**THINKING ABOUT TRUCKS?**

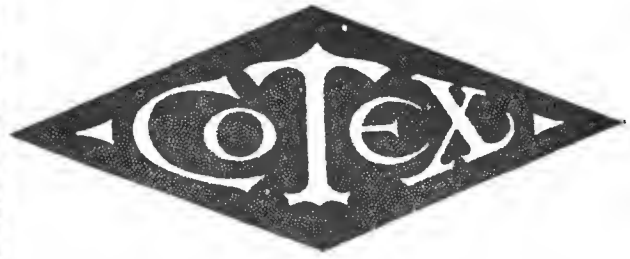
If you are, you're thinking about motors—wondering which one will stand up best under the tests your work will put it to. Men who know motors will tell you there's dependable quality in Wisconsin Consistent Motors that keeps them on the job, working at full efficiency.

Motors for pleasure cars, trucks and tractors. Write for specifications.

**WISCONSIN MOTOR MFG. CO.**  
 Sta. A, Dept. 310 MILWAUKEE, WIS.

New York Branch: 21 Park Row  
 T. M. Fenner, Factory Representative

Pacific Coast Distributors: Earl P. Cooper Co., 1428 Bush St.,  
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**Coated Textiles**  
 of  
**Highest Quality**

We manufacture artificial leather, or leather cloth, for upholstering and trimming automobiles.

Our product is used extensively by the largest manufacturers.

Our plant is modern in every respect and enables us to manufacture a uniformly high-grade product.

We make special goods for special purposes, and



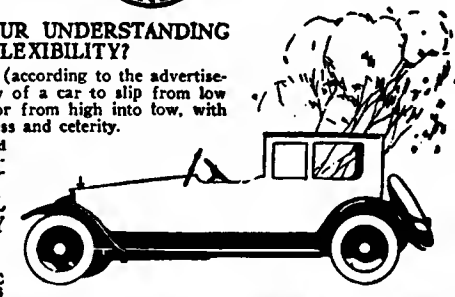
will solve your upholstery problems.

We invite inquiries

**The Cotex Company**  
 NEWARK NEW JERSEY

**THE MULHOLLAND CO.**  
 DUNKIRK, N. Y.  
 Body Builders for over 50 years  
 Demountable Tops for Franklin, Cadillac  
 and Cole  
 Write or wire for details. Quick delivery


**OWEN MAGNETIC**  
 WHAT IS YOUR UNDERSTANDING OF FLEXIBILITY?  
 Flexibility means (according to the advertisements) the ability of a car to slip from low speed into high, or from high into low, with extreme smoothness and celerity.  
 Flexibility—approached in other cars—is actually attained in the Owen-Magnetic.  
**BAKER R & L COMPANY**  
 Cleveland, Ohio  
 Manufacturers of OWEN MAGNETIC MOTOR CARS  
 Salesrooms— New York Boston Philadelphia Chicago



**The "Grip-Tight" Suit Case Holder and Luggage Carrier**  
 Convenient—Inexpensive—Holds Fast—No Rattling or Swaying  
 Holds absolutely tight. Removed and carried under seat when not in use.  
 Weighs 3 lbs. Carries 300 lbs.  
 If dealer hasn't it will send parcel post on receipt of price.  
 \$4.00 (complete with canvas bag).  
**The Grip-Tight Holder Co.,**  
 Norwich New York



**THE FULTON TRUCK**  
 Dealers—Write for territory still open  
 The first full 3000-pound capacity chassis ever offered at  
**\$1090**  
**Fulton Motor Truck Co.**  
 Farmingdale, Long Island  
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**The "Big Stick" That Brings Down Gasoline Expense**  
 Up goes the price of gasoline! Maximum mileage is the big problem of the day! Solve it with the New Stromberg Carburetor.  
 The official world's records made by the New Stromberg in gasoline mileage prove that you need the New Stromberg on your car. Mail coupon for details of how the New Stromberg will reduce your gasoline bills.  
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**New STROMBERG Does it! CARBURETOR**

**LYCOMING MOTORS**  
 Nothing in the World like it - for Power -  
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**Ever Good**  
 RUST PROOF MIRRORS  
 Numerous Models to fit Windshields, Bodies, Fenders, Limousines, Motor Trucks  
 One Quality—The Highest, both in Workmanship and Finish  
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**M**otoring and Motor Cars  
**O**nly weekly devoted to the interests of car owners and dealers  
**T**he recognized "Motoring Authority of America."  
**O**ne subscription price of \$3.00 per year  
**R**eal service department for the benefit of its readers  
**A**rticles by expert and recognized authorities  
**G**uarantees to increase your motoring pleasures and reduce your upkeep expense  
**E**stablished in 1899  
**MALLERS BLDG. CHICAGO, ILLINOIS**

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# YOKUM

## The New High-Speed Motor

**KEYSTONE MOTOR MFG. CO.**  
East Greenville, Pa.

# CANADIUM

CONSULT US REGARDING ITS ADAPTABILITY FOR MAGNETOS, MASTER VIBRATORS, CAUTERY KNIVES, COILS, ETC. Can interrupt circuit at minimum expense to Purchaser. Years spent in its development. Write us asking its uses. Can be used to replace platinum.


**The Electro Metals Products Co.**  
Patentees and Sole Manufacturers  
1984 East 66th Street Cleveland, Ohio



**CHASE**  
Drednaut Motor Topping, Leatherwove Upholstery, Plush Motor Robes, Wool Robes, Steamer Rugs, Wexford Motor Cloths for Tops and Slip Covers, Rubber Cloths for Tops and Curtains. Felt and Rubber Radiator Covers.

**MOHAIR VELVETS**

**L. C. CHASE & CO.**  
NEW YORK BOSTON CHICAGO  
DETROIT



## 22-73 SERIES

They follow closely the lines of the preceding series, and the only changes are in the nature of refinements.

- 22-73 Touring
- 22-73 Sporting
- 22-73 Runabout
- 22-73 Raceabout
- 22-73 Touring-Limousine

*Literature Mailed on Request*

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400 Whitehead Road Trenton, N. J.



## JUMBO SPARK PLUGS

Jumbo "MOLITE" 50 Cents

Guaranteed For The Life of The Car

Other types for Fords and other cars, 45 cents. Ask your dealer or write direct to the manufacturers. 69-37

**GIBSON-HOLLISTER MFG. CO.**  
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### Fit Every Demand

There are BEAVER Motors in a variety of sizes, suitable for all pleasure car and commercial car requirements. Meet all demands for power, economy and dependability. Over-head valves. 20% to 25% more power than other motors of same bore and stroke.

Write today for BEAVER specifications before deciding on the motor to use.

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1st & Oklahoma Ave., Milwaukee, Wis.

Passenger and Commercial Car Motors  
Model M. L. C.  
4-Cylinder-4-Cycle



## ZENITH CARBURETOR

KNOWN the world over as the zenith of carburetor efficiency. A long list of American builders of cars, trucks and aeroplanes believe this simple, plain tube device to be the best insurance for permanent carburetor satisfaction.

**Zenith Carburetor Co.**  
New York Detroit, U.S.A. Chicago



## Firestone Accessories

prolong the life of the tires. Used promptly they are the valuable "stitch in time."

Dealers—Take advantage of the satisfied trade which results from Firestone sales.

**Firestone Tire and Rubber Company**  
Akron, Ohio  
Branches and Dealers Everywhere

- Hook-On Boot
- Cure Cut
- Cementless Tube Patches

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**Add to Garage Profits by Oxy-Acetylene Welding**  
Savings made please your patrons and pay good substantial profits

**PREST-O-LITE**  
Dissolved Acetylene  
(Ready-made carbide gas)

adds to the efficiency and usefulness of any good welding equipment. We furnish thoroughly high-grade welding apparatus for \$75.00 (Canada, \$100.00). The average user will also need gas cylinders at an additional cost, and about \$10.00 worth of welding supplies. Truck and special equipment for cutting operations at extra cost.

Send for details of Prest-O-Lite Service for Oxy-Acetylene Welding.

**THE PREST-O-LITE CO., Inc.**  
The World's Largest Makers of Dissolved Acetylene

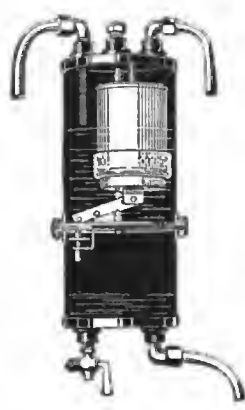
U. S. Main Office & Factory, 234 Seeway, Indianapolis  
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**Electric Auto-Lite**  
Starting—Lighting—Ignition

Electric Auto-Lite equipment for automobiles is as famous for the service that backs it as for the reliability and economy of its operation.

**ELECTRIC AUTO-LITE COMPANY**  
Home Office and Factory: Toledo, Ohio  
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**HECO**  
VACUUM FUEL SYSTEM

Only One Valve

Positive Mechanical Action  
No Loss From Evaporation  
Simple Sturdy Construction

**HEINZE ELECTRIC CO.**  
Lowell, Mass. Chicago  
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*The Hundred Point Six*

The car of a Hundred Quality Features that is quick on the get-away, speedy as you like and rambles down to the merest creep on high. Inspect it today. DEALERS—cash in on the big demand for KisselKars in unattested territory. Write or wire us for details.

**Kissel Motor Car Co.**  
Hartford, Wisconsin

**KISSELKAR**  
EVERY INCH A CAR

**Johns-Manville**  
FIRE  
Extinguisher

Always  
Ready!

SAVES 15% ON  
AUTO INSURANCE



THE JOHN'S-MANVILLE SERVICE  
THE CONTINENT

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DEALERS, JOBBERS AND GARAGEMEN

More than a "trade paper"—an institution of service for the merchandise and maintenance departments of the car and accessory industry. Builds sales—improves service—increases profits.


Published weekly, \$2.00 per year—Canada and foreign \$4.00. Subscriptions solicited only from men in the trade. Send subscriptions to

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*National*  
**Speedway Tires**

For quality, stamina, strength and general dependability, just test a NATIONAL "Speedway" against the tires you are now using.

**National Rubber Co., Pottstown, Pa.**



NUMBER 419

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*Long Beach*  
*Mr. Rogers*

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# SEXTONS

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## MOTOR OIL

*"Your Motor's Best Friend"*

Send for Catalog. Dealers—Distributors, Write  
**SEXTON OIL CO., 1173 Peoples Gas Bldg., Chicago, U.S.A.**

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The Six of Advanced Construction

UNIQUE VALUE **\$1250** RAPID SELLER

Detroit Motor Car Co., Detroit, Mich.



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Motorists insist on having the best spotlight manufactured. DEALER: Satisfy your customers by selling them the best and latest improved Spotlight manufactured. Complete in every respect. Ready to attach.

Edmunds & Jones Corporation  
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## Electric Starting and Lighting Systems

### SINGLE UNIT and TWO UNIT Equipments

Booklet on Special Ford Equipment

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RADIAL RETAINERS

MADE IN AMERICA

COMPLETE THRUST BEARING

Manufacturers of Star Radial Ball Retainers, Star Ball Thrust Retainers, Star Complete Ball Thrust Bearings

## Miller Carburetors


DEALERS

A matter of vital interest to your patrons is more efficient carburetion. Simplicity of construction, maximum efficiency, absence of trouble-making adjustments, ability to use cheaper fuels than gasoline, are a few exclusive MILLER features.

We have an exceptionally fine dealer proposition. Particulars on request from nearest distributor.

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PROVEN BEST IN EVERY TEST



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Inner Tubes, Inner Liners, Outer Boots, Inner Sleeves, Blowout Patches, Cementless Patches, Cement Patches, Red Rubber Tubing.

INDIANA RUBBER AND INCREASED WIRE CO.  
 JOHNSBORO

## OLD SOL

### NITROJECTOR NO 100

THE 100% PERFECT SPOTLIGHT

# \$10

Complies with all laws for no-glare devices. Other dependable Old Sol Spotlights are No. 70—\$7.00, No. 77—\$5.00

Ask for Old Sol for Safety

General Motors Mfg. Co. Inc. Ford Motor Co. Inc. etc.

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\* Complete Line of \*

## GREASE CUPS, OIL CUPS AND OIL HOLE COVERS



**SPRING SHACKLE BOLTS**



**HUB CAPS**

**METAL STAMPINGS**

**IN LARGE QUANTITIES**

"Sterling" Manufactured by "Acorn"  
**THE WINKLEY CO., Detroit, Mich.**  
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## Under Nearly Every Hood ECLIPSE-BENDIX DRIVE

**Transmits Starting Power  
on 125 Makes of Automobiles**

### ECLIPSE MACHINE CO.

ELMIRA, N. Y.



### NEW DEPARTURE BALL BEARINGS

American Made for American Trade  
QUALITY FIRST  
THE NEW DEPARTURE MFG. CO.  
CONRAD PATENTS LICENSEE  
BRISTOL CONN., U. S. A.

## HAMILTON MULTOMETER



**13** Accurate Records—measures individual mileage for four tires in service and two spare. Gasoline and oil consumption — car speed — trip mileage — season mileage — indicates necessary adjustments at end of each 500 and 1000 miles.

Made by the men who make The Hamilton Watch, "The Railroad Time-Keeper of America."

### The Hamilton Corporation, LANCASTER, PA., U. S. A.



Here is the perfect package for Parcel Post use. Mail samples, parts, small orders and shipments in

## "BULL DOG" MAILING BAGS

save time and money wasted wrapping, tying and tagging packages. Saving in postage alone more than pays for bags. Made of cloth. Strong, compact. Fasten with drawing. Made in all sizes for all requirements. We also manufacture cotton bags for packing into tire chains, inner tubes, grease cups, ball bearings, etc. Send for prices and full information.

**NATIONAL BAG COMPANY**  
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## THE METAL OF METTLE

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### THE BEST BEARING METAL ON THE MARKET

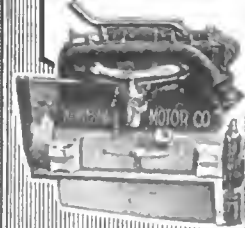

Fabrig Metal is an exceptionally homogeneous tin base copper hardened alloy made by our special process from Straits tin and ingot copper. We make every pound of Fabrig Metal ourselves and can guarantee its uniformity and quality. Ask Stutz, Simplex, Crane, Wisconsin, Kissell, Waukesha, Kelly-Springfield, Beaver, Curtiss and the man who makes finished bearings.

**Fabrig Metal Company, 34 Commerce Street, New York**

## Waukesha

TRADE-MARK REG

### TRUCK MOTORS

Superior design, materials, workmanship give battle-ship strength and aeroplane lightness. Catalog L gives full details. Write

**WAUKESHA MOTOR CO.**  
220 Factory St., Waukesha, Wis.

*"The Exceptional Motor"*



Used the World Over

## SKF

Quality and Service

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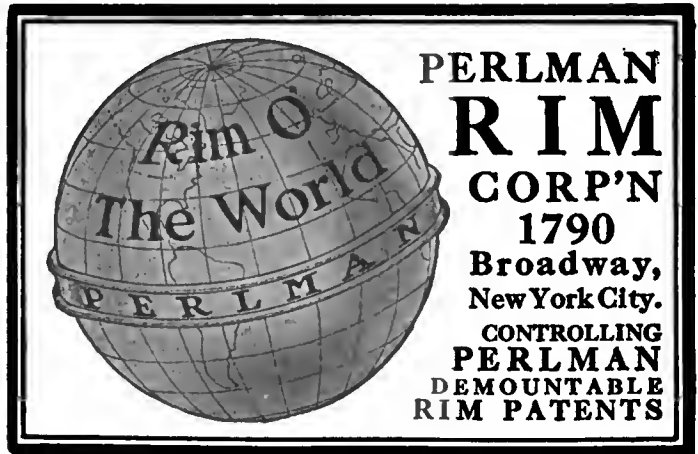


# BOSCH MAGNETO IGNITION

is reliable—every championship race of 1916 was a Bosch Magneto Victory—every one. You can have that same reliability of ignition by simply insisting on Bosch.

*Be Satisfied*                      *Specify Bosch*

BOSCH MAGNETO CO., 220 W. 46th St., New York



# PERLMAN RIM CORP'N

1790  
Broadway,  
New York City.

CONTROLLING  
PERLMAN  
DEMOUNTABLE  
RIM PATENTS



*Hartford*  
UNIVERSAL Joints  
Cone Clutches—


632% increase in production for 1915-16 over 1914. 57 different makes of pleasure cars and trucks are now using our products. Two large, completely equipped plants—Hartford and New Britain, Conn. Manufacturing exclusively Universal Joints and Cone Clutches for Motor Cars.

Established 1906

**The Hartford Automobile Parts Co.**  
Hartford, Conn.

# MOLTRUP STEEL PRODUCTS COMPANY

Manufacturers of



## HIGH GRADE FINISHED CRANK SHAFTS

BEAVER FALLS                      PENNSYLVANIA



SPEED                      POWER

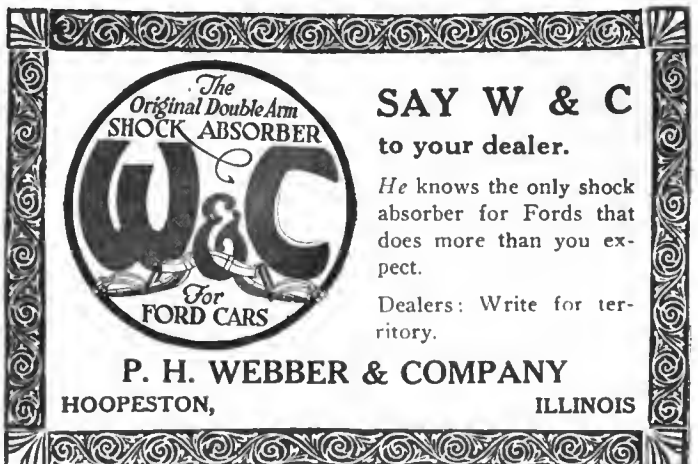
Standard Equipment on  
Packard  
Marmon  
National  
Haynes  
Kissel  
Pathfinder  
Etc.

**BURD**  
High Compression  
Rings

The GUARDED Opening

BURD HIGH  
COMPRESSION  
RING CO.  
Rockford,  
Illinois

Sales Offices  
in all  
Principal  
Cities



The Original Double Arm  
SHOCK ABSORBER

# W & C

For FORD CARS

## SAY W & C to your dealer.

He knows the only shock absorber for Fords that does more than you expect.

Dealers: Write for territory.

**P. H. WEBBER & COMPANY**  
HOOPESTON,                      ILLINOIS

# Atwater Kent Ignition



For Your Car  
Atwater Kent Mfg. Works  
Philadelphia, U.S.A.



The car of owners' interest, designed from the first to include all features for owner satisfaction.

# LIBERTY

Selling by thousands all over the nation in direct comparison with every other car made. \$1195.

Liberty Motor Car Company  
Detroit



"All dependable systems now use it."

**WARD LEONARD**  
26 YEARS  
EXPERIENCE  
**DYNAMO  
CONTROLLERS**  
FOR  
LIGHTING  
AND  
STARTING  
SYSTEMS

**WARD LEONARD  
ELECTRIC CO.**  
MT. VERNON, N. Y., U. S. A.

**MOTOR PRODUCTS CORPORATION**

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Main Office and Factory, Detroit Mich. Factories also at Ann Arbor Mich., and Walkerville, Can.  
**SUCCESSORS TO**  
Rands Mfg. Co.  
Vanguard Mfg. Co.  
Superior Mfg. Co.  
Diamond Mfg. Co.  
Universal Metal Co.

**No Lights! No Spark! Now What?**

What if your electrical equipment should fail you on a black night, suddenly, without warning, on a bad part of the road? Don't let it happen! Put a



**Weston**  
MODEL 354 AMMETER  
**On Your Dashboard or Cowl**

It is the reliable means of determining the proper rate of charge or discharge of your battery for various speeds. It enables you to determine that the generator is working and that the storage battery is receiving its proper charge. Write us!

Weston Electrical Instrument Co.  
8 Weston Ave., Newark, N. J.  
23 Branch Offices in the Larger Cities

**SUNDERMAN \$5**  
**Vacuum Carburetor**

Saves 30 to 50% on your Gasoline Bill

**Starts Easily in Cold Weather**

Combines Power, Quick Pick-up, Fast Getaway, Flexibility, Safety from Backfire and Operating Economy with a Remarkably Low Price, for any car up to 45 H. P. A Wonder on Fords.

DEALERS—Fine Territory Still Open—AGENTS

**SUNDERMAN CORPORATION**  
5 Chambers St. Newburgh, N. Y.  
Weston Sales Office: Detroit, 403 Kresge Bldg.

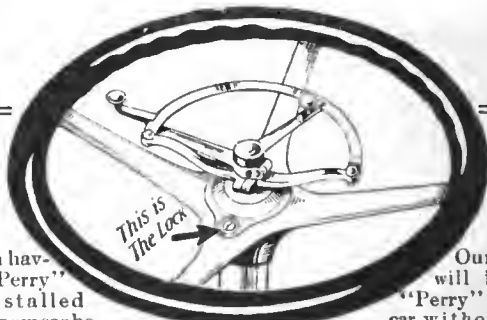
**IRIDIO-PLATINUM TIPPED  
Screws and Rivets**

**SERVICEABILITY**  
is a distinguishing feature of these Screws and Rivets.  
Securely welded Iridio-Platinum heads. Standard sizes carried in stock. Other styles to order—any specifications, any degree of hardness.  
Write us for prices and full information.

**R & H Platinum Works**  
of Roessler & Haaslecher Chemical Co.  
100 William Street New York



**On Your New Car—**



**On Your Present Car—**

Insist on having a "Perry" Lock installed on your new car before it is delivered to you. The insurance saving alone will pay for it this summer.

**"PERRY"**  
The Only Lock That Thieves Won't Touch

Our dealer will install a "Perry" on your car without labor charge. Takes just a minute. Makes your car thief-proof. For no thief ever stole a car that was "Perry Locked."

This is the lock that disconnects the steering wheel. Sold by dealers everywhere. 15% to 40% reduction on your insurance.

Ferry Auto Lock Co., Dept. G, 1238 Michigan Blvd., Chicago

**BROWN—LIPE  
GEAR—CO—  
TRANSMISSIONS**

SYRACUSE · N. Y.

**DIFFERENTIALS  
BROWN—LIPE  
CHAPIN—CO.**

**Get this display rack FREE**

It will pay you to carry Jenkins Vulcan Springs in stock because you make a good margin of profit and at the same time satisfy your customers. With your order for an assortment of one dozen or more, this hardwood display rack sent free. Send for prices—trade discounts.

**JENKINS VULCAN SPRING CO.**  
1414 Chestnut St., St. Louis, Mo.

Distributing Houses at  
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Minneapolis, Minn., 1024 Hennepin Ave.  
Fort Worth, Tex., 708 Commerce St.  
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# The Clearing House of the Automobile Industry

*For Second-Hand Cars, Surplus Parts, Accessories, Tires  
Machinery & all other special Announcements of a similar Character*

## FORGINGS (Valve)

Head Diameter	Stem Length	Stem Diameter	Material Nickel	Price Net
2 1/2"	8"	5/8"	3 1/2%	.50
2 1/4"	8 1/2"	5/8"	3 1/2%	.50
2 1/4"	4 1/2"	5/8"	3 1/2%	.50
2 1/2"	4 1/2"	5/8"	3 1/2%	.50
2 3/4"	7 1/2"	5/8"	3 1/2%	.60
2 3/4"	9 1/2"	5/8"	3 1/2%	.65
3"	6 1/2"	5/8"	3 1/2%	.80
2 3/4"	9 1/2"	5/8"	3 1/2%	.70
3 1/4"	9 1/2"	5/8"	3 1/2%	.70
3 1/2"	12"	5/8"	3 1/2%	.70
3 1/2"	9 1/4"	5/8"	3 1/2%	.70
3 1/2"	12"	5/8"	3 1/2%	.80

The above forgings are useful in all machine shops where oversize stems and heads are necessary. We can make immediate shipment of any of the above sizes up to 100 each.

We also maintain in stock for immediate shipment forgings such as:

- Slide Gears
- Differential Pinions
- Bevel Gear
- Differential Spider
- Rocker Arm
- Transmission Gear
- Axle Shafts
- Propeller Shafts

No Cold Rolled Steel—only nickel

Bulletin No. 12

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This Season's Pleasure of Motoring at a FRACTION OF ORDINARY COST

**We Sell Tires  
30% Lower  
Than 1916 Prices**

(Since January tires went up over 40%)

**Better Tires for LESS MONEY  
A Trial Order Will Convince You  
WARNING**

The scarcity of tires makes another advance imminent

**ORDER NOW**

**Guaranteed New Fresh Stock**

Tires Tubes		Tires Tubes	
28 by 3...	\$6.25 \$1.75	35 by 4...	\$16.50 \$3.35
30 by 3...	7.70 2.00	36 by 4...	16.95 3.45
30 by 3 1/2	9.50 2.25	33 by 4 1/2	13.90 3.90
31 by 3 1/2	10.00 2.50	34 by 4 1/2	17.85 3.85
32 by 3 1/2	11.00 2.40	35 by 4 1/2	19.65 3.90
34 by 3 1/2	12.50 2.45	36 by 4 1/2	19.95 4.00
31 by 4...	14.55 2.65	37 by 4 1/2	21.70 4.15
32 by 4...	14.90 2.80	35 by 5...	22.35 4.45
33 by 4...	15.55 3.00	36 by 5...	22.55 4.55
34 by 4...	15.90 3.15	37 by 5...	25.15 4.85

10% more for non-skid.

Double Oversize for 36 by 4 1/2 Rims.  
38 by 5 1/2 Clincher, while they last—**\$26.75**  
Each.....

## First Grade Used TIRES & TUBES

Good for About 2000 Miles  
Service at a Great Saving

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28 by 3...	\$3.25 \$1.00	37 by 4...	\$9.40 \$1.85
30 by 3...	4.00 1.10	34 by 4 1/2	8.25 1.75
30 by 3 1/2	4.76 1.25	35 by 4 1/2	8.90 1.80
31 by 3 1/2	5.00 1.25	36 by 4 1/2	9.50 1.90
32 by 3 1/2	5.75 1.40	37 by 4 1/2	9.75 1.90
34 by 3 1/2	6.00 1.50	35 by 5...	9.25 1.90
31 by 4...	6.75 1.55	36 by 5...	9.50 2.00
32 by 4...	7.00 1.55	37 by 5...	10.00 2.10
33 by 4...	7.75 1.60	38 by 4 1/2	13.50 2.50
34 by 4...	8.25 1.65	39 by 5...	15.00 2.50
35 by 4...	8.00 1.70	42 by 4 1/2	15.00 2.50
36 by 4...	8.25 1.75	43 by 5...	16.00 2.75

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One dollar deposit or sufficient to cover express charges required with each mail order.

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Our  
**TIRES & TUBES**  
BUY NOW!  
Prices Are Going Higher

Don't Hesitate to  
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All fresh selected  
stock of standard  
makes.

Size	New Tires	New Tubes
28x3	\$6.50	\$1.50
30x3	7.50	2.00
30x3 1/2	9.50	2.25
31x3 1/2	10.00	2.50
32x3 1/2	10.50	2.50
34x3 1/2	11.00	2.55
31x4	13.75	2.90
32x4	14.50	3.20
33x4	14.75	3.25
34x4	15.25	3.35
35x4	15.50	3.45
36x4	16.00	3.50
34x4 1/2	18.25	4.00
35x4 1/2	19.00	4.00
36x4 1/2	19.50	4.00
37x4 1/2	20.00	4.00
35x5	19.50	4.00
36x5	20.50	4.00
37x5	22.00	4.00

ADD 10% FOR NON-SKID

Bargains in Slightly Used and Demonstrating Tires

Size	Used Tires	Used Tubes
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30x3 1/2	4.25	1.45
31x3 1/2	4.90	1.50
32x3 1/2	5.25	1.50
34x3 1/2	5.50	1.60
31x4	6.25	1.65
32x4	7.00	1.60
33x4	7.25	1.70
34x4	7.75	1.70
35x4	7.25	1.75
36x4	7.50	1.75
34x4 1/2	7.90	1.75
35x4 1/2	7.90	1.80
36x4 1/2	8.00	1.85
37x4 1/2	9.25	1.90
35x5	8.00	2.00
36x5	9.10	2.00
37x5	9.50	2.20

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Hundreds of Slightly Used

# TIRES and TUBES

Which Are Good for Thousands of  
Miles of Service.

Prices will interest you

MAIL ORDERS SHIPPED SAME DAY

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TWO PHONES—CAL. 1388; CAL. 6794

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| Studebaker-Garford       | Maxwell, all models to 13 |
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| Dorris, 1906, '10        | Pierce-Arrow, '07 to '12  |
| Peerless, 1906 to 13     | Ohio—Hudson, 20 to 33     |
| Stoddard-Dayton          | Bergdoll-Staver           |
| Regal—Stevens Dryden     | Allen, 15 & 16—Atlas      |
| Midland-Wayne-Weich      | Mitchell, 1908 to '13     |
| Henderson—Speedwell      | Thomas, all models        |
| Stearns 30 to 60         | Great Western—R. C. H.    |
| Kless 6—Matheson         | Oldsmobile Special Ltd.   |
| Amplex all models        | Autocrat Defender         |
| Pope Toledo              | American Underwing        |
| Pope Hartford            | 30 to 50—Welch            |
| Oakland—Selden           | Marmon—Carter Car         |
| Interstate—Jackson       | Overland 38-40-41-42-45-  |
| Reo, 1908 to '13         | 46-51-52-54-55-56-59-     |
| Gilbe-Warren Holladay    | 60-69-71                  |
| Locomobile—Knox          | Page 25 & 36              |

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16 Overhead Valves, Rocker Arms Push Rods. Spe-  
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National Bank Building, Durham, N. C.

## MANUFACTURERS'

# ATTENTION!

If you have on hand a discontinued line  
of axles, wheels, or parts; in fact, materi-  
al of any kind that is not being used  
for present manufacturing purposes, it will  
be to your advantage and profit to per-  
mit our Clearing House Department to  
help you turn it into cash. We are in  
touch with buyer and seller, and our Ser-  
vice Department will be glad to confer  
with you on this subject.

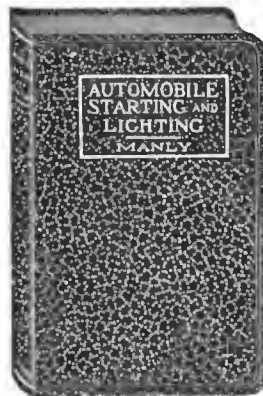
THE AUTOMOBILE.

CLEARING HOUSE DEPARTMENT,  
239 West 39th St., New York.

# Automobile Starting and Lighting

By H. P. MANLY

A Non-Technical Explanation of the  
Construction, Upkeep and Principles of  
Operation of the Electrical Equipment  
of Automobiles.



Designed especially for the electrical  
worker, whether expert or novice.  
Special attention is given to methods  
of adjustment, care, testing and trouble  
location, with special reference to the  
armature, brush, charging system, cir-  
cuit breaker, commutator, cut-out,  
dynamo, fields, fuses, lamps, lighting  
switch, regulation, starting and wiring.

The following chapter headings show the scope of the  
work: I. Electric Lighting and Engine Starting Equipment.  
II. Lighting Dynamos and Starting Motors. III. Storage  
Batteries. IV. Lamps and Wiring. V. Control Parts.  
VI. Dynamo and Motor Drives. VII. Current Measuring  
and Indicating Devices. VIII. Starting and Lighting  
Troubles.

302 pages. 128 Illustrations. Pocket size. Leather, gold  
stamping, red edges. Postpaid..... \$1.50

Cloth, ink stamping, postpaid..... \$1.00

BOOK DEPARTMENT

## THE CLASS JOURNAL COMPANY

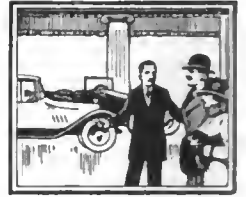
239 West 39th Street

New York





# Office and Salesroom Equipment & Supplies



## What Does Your Printing Signify

Every piece of printed matter that bears your name creates an impression.

If the impression is good it will aid materially in creating a desire on the part of those addressed to do business with you.

This fact applies with equal force to your letterhead, and also to your advertising literature.

You cannot get away from that impression. It is a fixed immutable law of human nature.

Our constructive suggestions have been adopted by a number of prominent firms whose printing impresses by its excellence.

If we can do the same for you you will be the greater gainer.

A postal will bring someone who can discuss your requirements intelligently—and from a constructive standpoint.

## BERKOWITZ & PROPER

Creator of Good Printing

64-68 FULTON STREET

NEW YORK CITY

### PLAY FAIR WITH YOUR BUSINESS

Isn't it worth something to create an impression in the mind of the recipient of your letter over and above your written message? Nothing can do this better than steel die embossed stationery—and the extra cost over type printed stuff, if you sent out fifty letters per day, would be about 10 cents. Play fair with your business; advertise it by using good stationery. Look over our samples. The only time to do so is now—write us for anything engraved—business or social.

**AMERICAN EMBOSSING CO.**  
192-196 Seneca St. Buffalo, N. Y.

### GRAND RAPIDS DISPLAY CASES

have been adopted as the standard method for displaying accessories by many of the finest equipped garages in the country. Illustrations and prices upon request.  
Grand Rapids Show Case Co.  
Grand Rapids, Mich.

### "WE ARE PREPARED"

to handle your order for engraved

Wedding Invitations or Announcements  
**TOWER BROS. STATIONERY CO.**

23 West 23rd Street New York

Samples Gladly Submitted

### Color & Half-tone ADVERTISING Printing COMPOSITION Perfect Service

Phone **AFFERTON** 406-426  
9063 Chelsea **PRESS** West 31st St.

### INCREASE YOUR SALES

by using Betta Fac-Simile Letters.  
Quick and Dependable Service.

**TROMBETTA PRESS**, 106 Fulton St., N. Y.

### WHY NOT ADVERTISE UNDER THIS HEADING FOR RESULTS

Please mention The Automobile when writing to Advertisers

### From Everywhere

in the trade there comes a demand for better systems, newer furniture, up-to-date machinery, attractive fixtures, new ideas.

**Dealers, Salesmen, Garagemen, Repairmen, Tiremen, Manufacturers**  
all are working for more progressive business methods and looking around for the necessary furniture, fixtures, machines and systems.

**Car Owners**  
are learning to appreciate the convenience and economy of patronizing the attractive up-to-date places.

For these reasons and in line with the policy of **THE AUTOMOBILE**, and our other publications—**MOTOR WORLD** and **MOTOR AGE**—to encourage any forward movement in the motor car field, we are, in this issue, opening a new department for the sale and purchase of Office and Salesroom Equipment and Supplies.

It is hoped that this department will be of material assistance to the trade by providing a quick and easy method of purchasing all things needed.

**AUTOMOBILE**  
239 W. 39th St., New York

# CONTRACT WORK

Advertisers in this section have facilities at their disposal to take on additional work on contract—  
AUTOMOBILE SPECIALTIES OF ALL KINDS MANUFACTURED ON CONTRACT BASIS  
SPECIAL MACHINERY - PRESS WORK - AUTO MACHINE WORK  
FOUNDRY WORK - AUTOMATIC SCREW MACHINE WORK

Advertising Rates on Request

**SEND YOUR ORDERS  
FOR  
DROP FORGINGS**

TO  
**John Obenberger Forge Co.**  
West Allis, Wis.

## FIELDCO

Leather, Paper and Fibre  
Washers and Packings

All shapes All sizes

For all classes of automobile work  
Samples and quotations promptly submitted  
upon receipt of specifications.

**R. B. Field & Co.** Worcester, Mass.

## GEARS—GEARS

MACHINE PARTS—MACHINE ASSEMBLING  
JIGS—FIXTURES—TOOLS

Quick quotations on receipt of blue prints.

**GENERAL MACHINE WORKS**

Contract Manufacturers  
York, Pa.

## SERVICE PARTS GEARS—SHAFTS

We manufacture and distribute the following parts:  
Transmission Gears, Countershafts,  
Side Shafts, Differential Gears, Axle  
Shafts, Piston Pins, etc.

**SERVICE GEAR & MACHINE CO.**  
Reading, Pa.

## CAMS! BROACHING!

Let us figure on your requirements

**MAYDRITE MACHINERY CO.**

Bergen and Kearney Aves. Jersey City, N. J.

Radiator, Metal Body and  
Mud Guard Manufacturing

Fully equipped plant ready to manufacture  
in quantities. Highest class workmanship at  
reasonable prices. Prompt service.

Call or write for quotations.

**Camden Auto Radiator Co.**

H. Z. Cutler, Proprietor

509 Arch Street Camden, N. J.

## SCREW MACHINE PRODUCTS

We Specialize on  
**AUTOMOBILE PARTS**

such as  
Spark Plug Shells and Bushings—Castel-  
lated Nuts—Spring Shackles—S. A.  
E. Cap Screws

We shall be glad to quote on your requirements  
for any parts that can be turned from bar steel 1/4"  
to 2 1/4" diameter.

**Crittenden Manufacturing Company**  
Boston, Mass.

## If You Want PARTS

Of Any Kind Manufactured

Communicate with THE INTERESTS  
back of this advertisement, stating  
your requirements, as we are so situ-  
ated to serve you to advantage. Ad-  
dress Box C710, care of Contract  
Dept., The Automobile.

**WE SERVE THE BEST MFRS.  
WHY NOT YOU?**

Maximum quality, minimum cost. High grade tools,  
special machinery, jigs dies, fixtures, gauges. Mod-  
ern, sanitary plant. Thoroughly trained mechanics.

Carroll Service is second to none.

Get our estimates.

**THE CARROLL ENGINEERING CO.**  
324 Xenia Ave., Dayton, O.

## THE BIEHL IRON WORKS, Inc.

Reading, Pennsylvania

Special facilities for metal truck bodies,  
iron and steel forgings and steel plate work.

Prompt service.

Send blue prints and let us quote you  
prices.

# HUNDREDS

of machine shops are  
ready for contract  
work.

Tell us your needs, and we will  
find the shop that will handle  
the work for you.

**THE AUTOMOBILE**

**CONTRACT WORK DEPARTMENT**

239 West 39th Street New York

## NOTICE OF ANNUAL MEETING

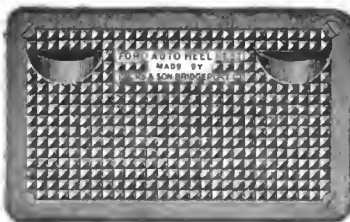
Take notice that the annual meeting of the stockholders of the Commercial Vehicle will be held at the office of the company, No. 239 West 39th Street, New York City, on Wednesday, May 23, 1917, at eleven o'clock A.M., for the purpose of electing directors and the transaction of such other business as may properly come before the meeting.

E. M. COREY, Secretary.

## NOTICE OF ANNUAL MEETING

Take notice that the annual meeting of the stockholders of the Class Journal Company will be held at the office of the company, No. 239 West 39th Street, New York City, on Wednesday, May 23, 1917, at ten o'clock A.M., for the purpose of electing directors and the transaction of such other business as may properly come before the meeting.

E. M. COREY, Secretary.



### Auto Heel Rest for Fords

Size 5" x 7" x 1/4"  
Made of frosted aluminum with a 3/4" in. plain edge—protects the rubber mat on all Ford models. Locates the heel for both clutch and brake pedals—will not flatten or wear thru.

A neat, useful foot rest, sold by all dealers, at \$1.00 each, or will be sent postpaid on receipt of the price.

We also make the Auto Heel Rest which has been used so extensively on other cars for the same purpose.

Dealers—Send for circular and trade discount. Made only by  
**J. L. LUCAS & SON, Bridgeport, Conn.**



## AUTOMOBILE Body Sheets

Also materials for Tanks, Hoods, Guards, Fenders, Radiators, Frames, Etc. "THURITE" Deep Drawing Stock, Enameling and Japanning Stocks, Roofing Products, Etc.

**AMERICAN SHEET AND TIN PLATE COMPANY, Frick Bldg., Pittsburgh, Pa.**

## ENGINEERS

Are you having trouble with springs?  
50 years' experience in designing and manufacturing commercial vehicle springs.

**THE E. R. MERRILL SPRING CO.**

526-532 W. 28th Street New York City  
Established in 1863



## "Zones of Quiet"

Send us your Blue Prints or Sample Gears for estimates  
**ALBAUGH-DOVER CO., 2100 Marshall Blvd., CHICAGO**

# GEARS

Please mention The Automobile when writing to Advertisers

# When Time Counts

The thoroughness of our organization together with the size and facilities of our plant assure prompt delivery of SAE Standard Cap Screws, SAE Semi-Finished Nuts, SAE Castellated Nuts, as well as



## Automatic Screw Machine Products

When time is an important factor with you it would be well to remember this fact.

Remember! When placing an order with the Corbin Screw Corporation you are placing it with an organization qualified both by experience and capacity to fill orders in the shortest possible time with products of the highest quality.

We shall be glad to submit quotations and advice on delivery upon receipt of blue prints and specifications.

We also manufacture Cap and Set Screws, US threads, Machine Screw standard ASME, Machine Screw Nuts, Wood Screws, Stove Bolts, Tire Bolts, Thumb Screws, Thumb Nuts, etc.

## The Corbin Screw Corporation

The American Hardware Corporation, Successor  
NEW BRITAIN, CONN.

BRANCHES: New York Chicago Philadelphia

Makers of Corbin-Brown Speedometers



Engineers of Motor Cars or Parts will find many of their problems solved in the

## Schatz "Universal" Annular Ball Bearing

This internationally standardized bearing sustains successfully no less than 60 per cent of its rated radial capacity in thrust load in either direction and without adjustment of any kind. Send for catalog and data sheets.

The Federal Bearings Co., Inc.  
26 William Street Poughkeepsie, N. Y.

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## Reason No. 1 Won't Get Out of Order



The strong, simple, compact construction of

### BRITTON Priming Cups

insures their being always in working order.

Made of two inseparable parts.

Can't work loose, get lost, or get out of order.

They do not become leaky with wear.

Write us for prices and discounts. Their price is very reasonable.



### Peter A. Frasse & Co., Inc.

417-421 Canal St., New York, N. Y.

The Britton priming cups and the Britton drain cocks work on exactly the same simple principle. Week after next look for Reason No. 2.

## Friction starts Grinding before Grease begins Lubricating

Common grease needs heat to soften it before it can lubricate. The parts grinding together must furnish this heat in the shape of friction. Meanwhile these parts get no lubrication. And Friction—getting a good start—is *never* caught up with by grease.



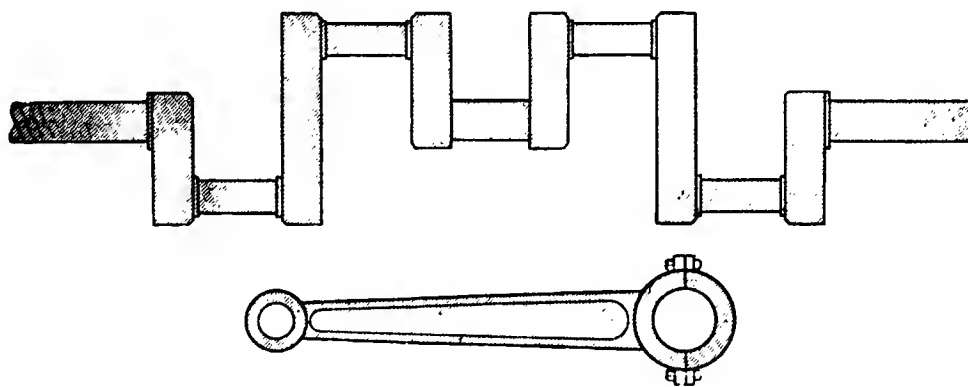
### Lubricates Instantly—and Always

NON-FLUID OIL lubricates the second your car moves from rest—and every minute it is in motion. Doesn't give friction a chance to start. It never melts, never leaks out, is much purer and longer lasting than any grease you can buy.

If you buy lubricants on the same basis that you buy tires—purely on *service*, you'll ask for NON-FLUID OIL *every time*. Get "K-oo Special" grade for gears; "K-oo" grade for bearings. Sold at your dealers in orange-colored cans only.

Write for a free booklet, "Lubrication of the Motor Car."

**NEW YORK & NEW JERSEY LUBRICANT CO.**  
165 Broadway New York City



## THE POINTS OF STRESS—AND **AGATHON STEELS**



### OUR PRODUCTS

"Agathon" Special Analyses  
 "Agathon" Vanadium  
 "Agathon" Silico Manganese  
 "Agathon" Chrome Nickel  
 "Agathon" Chrome Vanadium  
 "Agathon" Nickel Steels  
 "Agathon" Chrome Steel  
 "Agathon" High Carbon  
 Shipping Facilities—3 Railroads

**F**OR every part of an automobile where strength is required Agathon Steels are the most suitable. They are made to withstand strains. The exhaustive tests we make at every step in their manufacture insures this. And re-orders mean you get exactly the same quality as your first order, for we take a test bar of every heat that is carefully filed for future use.

An automobile is a thing of strains; and the crank and drive shafts come in for their share. Here is where Agathon Steels will fit for the automobile manufacturer.

Specify Agathon Steel and your worries are over for it is made to withstand hard usage.

Why not try Agathon Steel?

## THE CENTRAL STEEL COMPANY, MASSILLON, OHIO

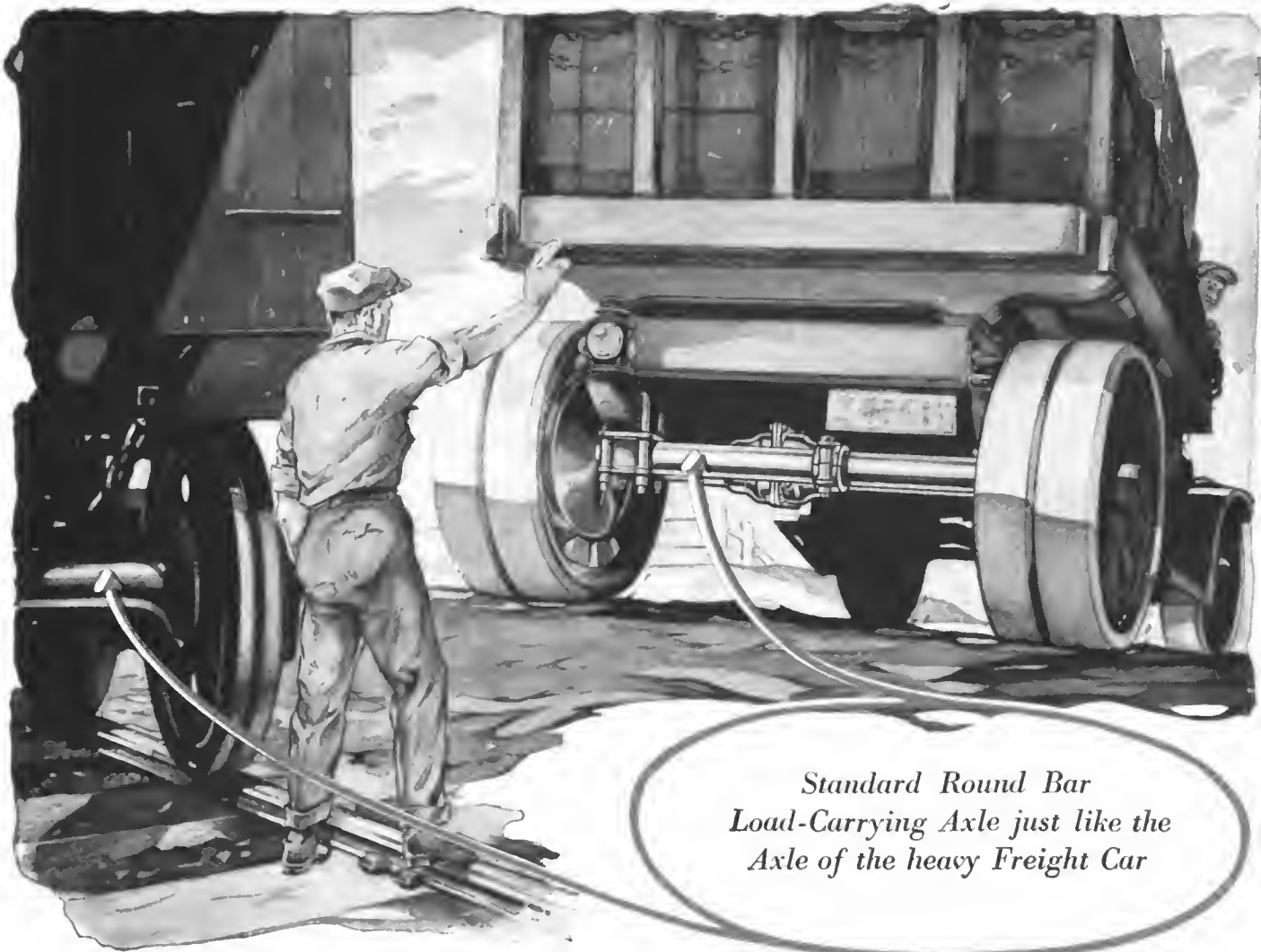
Detroit Office: 326-27-28 Ford Bldg.  
 F. Walter Guibert, District Representative

Cleveland Office: Kickox Bldg.  
 The Hamill-Hickox Co., District Representative

Chicago Office: Room 1370, Peoples Gas Building, 122 South Michigan Blvd.  
 A. Schaeffer, District Representative

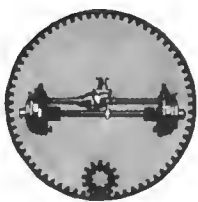
Philadelphia Office: 902 Widener Bldg.  
 Frank Wallace, District Sales Manager

General Export Agents  
 J. E. Dockendorff & Co., 20 Broad St., New York, N. Y.



*Standard Round Bar  
Load-Carrying Axle just like the  
Axle of the heavy Freight Car*

## Profit By Experience



The great railways of the world, masters in transportation equipment, employ a one-piece, standard round bar load-carrying axle on powerful locomotives and heavy freight cars.

The Russel Internal Gear Axle is the only American made shaft drive axle using a standard round bar load-carrying axle.

Profit by the experience of the masters in transportation equipment—and specify a Russel axle on your next motor truck.

# Russel

# Overland

TRADE MARK REG.



## The Road to Happiness

### Light Fours

Touring	\$695
Roadster	\$680
Country Club	\$795

### Big Fours

Touring	\$ 895
Roadster	\$ 880
Coupe	\$1250
Sedan	\$1450

All prices f. o. b. Toledo  
and subject to change  
without notice

The Automobile is a fundamental factor in modern everyday life. It rides the road to happiness.

In the purchase of a car this season, there are few facts which simplify the task of selection.

This year Willys-Overland Motor Cars comprise the most comprehensive and varied line ever built by any one producer.

The economies of our greater production are shared alike by every car in the line.

In thus broadly applying the established Willys-Overland policy

of greater production—greater economy, higher quality, lower price—we extend the benefits of our economies to include virtually every class of purchaser.

The Willys-Overland dealer is in a peculiarly pleasant position to frankly and honestly discuss with the purchaser his needs and requirements in a motor car.

For whatever his need the Willys-Overland dealer has the car to fill it and is prepared to demonstrate that he is offering the dominant value among cars of its kind.

### Light Sixes

Touring	\$1,195
Roadster	\$1,090
Coupe	\$1,385
Sedan	\$1,585

### Willys-Knight

Four Touring	\$1,395
Four Coupe	950
Four Sedan	950
Eight Touring	1,950

All prices f. o. b. Toledo  
and subject to change  
without notice

The Willys-Overland Company, Toledo, Ohio

Manufacturers of Willys-Knight and Overland Motor Cars and Light Commercial Wagons









